

AMBIENT AIR MONITORING PROGRAM
2001 ANNUAL SUMMARY REPORT
MUGGAH CREEK REMEDIATION PROJECT
SYDNEY, NS

FINAL REPORT

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EXECUTIVE SUMMARY

This report provides an annual summary for the Ambient Air Monitoring Program (AAMP) performed in 2001 as part of the Muggah Creek Remediation Project.

The Cape Breton Regional Municipality, located at the northeastern end of Nova Scotia, was one of the main industrial centres in Atlantic Canada. One of the largest industries was steel making, with its origin in Sydney dating back to the early 1900s. The steel making legacy has left Sydney with three environmentally impacted areas: the SYSCO steel plant, Tar Ponds and Coke Ovens site, all situated within the Muggah Creek watershed. An additional impacted site includes the Sydney Municipal Landfill, which is situated upgradient of the Coke Ovens site. Coking operations were halted in 1988 at the Coke Ovens site. Steel making was performed with an open arc furnace until 2001, at which time SYSCO was closed permanently.

During 2001, ambient air monitoring was performed in support of the Portable GC Monitoring Program, Technology Demonstration Program, Landfill Closure Project, and the Fixed Station AAMP.

The Fixed Station AAMP consists of the monitoring of 85 parameters in total, including polycyclic aromatic hydrocarbons (PAHs), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), particulate matter less than 10 microns in diameter (PM_{10}), metal parameters, and volatile organic compounds (VOCs). The sampling was performed in accordance with the National Air Pollution Surveillance (NAPS) schedule at six locations throughout the Industrial Sydney area. During periods of no remedial activity at the Coke Ovens site and Tar Ponds, the program operates on a 12-day schedule. During periods of activity, sampling is performed on a six-day cycle.

A comparison of the 2001 AAMP results for the four programs with the criteria available by regulatory agencies (Nova Scotia Department of Environment & Labour for TSP, Canadian Environmental Protection Agency for $PM_{2.5}$, and Ontario Ministry of the Environment (MOE) for PM_{10} , PAHs and VOCs) indicates that there were no exceedances of the referenced criteria, with the exception of one 24-hour criterion exceedance (out of 6 samples) to the CEPA $PM_{2.5}$ Canada-Wide Standard. The exceedance was attributable to heavy vehicle traffic along Kings Road, associated with Saturday Christmas shopping.

There was no apparent evidence that activities associated with the Landfill Closure Project and Technology Demonstration Program bulk sample collection adversely contributed contaminants of concern to the airshed.

During 2001 monitoring events, there was no apparent evidence that the Coke Ovens site and Tar Ponds appreciably contributed contaminants to the airshed during periods of no activity at these two sites. It is noted however, that when comparing upwind PAH data with downwind PAH data indicates that on two occasions (July 27th and September 20th), the Tar ponds appear to have contributed PAHs to the airshed, however, the reported values are well below the referenced guidelines.

A comparison of $PM_{2.5}$ and PM_{10} average November and December 2001 data with levels in the cities of Hamilton and Montreal for November and December 2000 indicated that with the exception of the $PM_{2.5}$ results for Kings Road and Intercolonial Street, average results for the Sydney AAMP were below those found in the other cities. The $PM_{2.5}$ average value at Kings Road was higher than the average value for Hamilton and Montreal. The PM_{10} average value at

Intercolonial Street was lower than the Hamilton average value and higher than the Montreal average value. PAH average November and December 2001 results identified in the Sydney airshed were higher than the average results identified in 2000 in St. John's and lower than the average total 2001 PAH value for Hamilton. Generally, VOC compounds measured in the Sydney airshed, such as benzene, toluene and o,m,p xylenes, that are known to be site contaminants for both the Coke Ovens and Tar Ponds sites were below levels found in the Hamilton and Halifax airsheds. Some of the USEPA Method TO14 chlorinated compounds were found in the Sydney airshed at levels that were marginally higher than those found in the Hamilton and Halifax airsheds.

Portable GC Program results for benzene and toluene indicated that benzene and toluene are found along roadways in urban areas at similar concentrations as found in the area of the Domtar Tank and Benzol Tank at the Coke Ovens site.

Portable GC Program results for benzene in snow pore spaces around the Domtar Cell area at the Coke Ovens site indicate that there are releases of benzene from the soil; however, no estimation of impact on the airshed can be made from this limited exercise. Toluene was not detected.

A review of the program has determined that metals are rarely detected in the $PM_{2.5}$ samples attributed higher laboratory detection limits than for metals in the PM_{10} fraction. The reason for the higher detection limits is because the $PM_{2.5}$ samples are collected using low volume samplers. In order to further assess metals that are found in the Sydney airshed, it is recommended that analysis for metals in $PM_{2.5}$ be discontinued and sampling for metals be initiated using TSP high volume samplers at three or four of the program locations. As well, there are no referenced guidelines for the metals collected from the $PM_{2.5}$ fraction, whereas there are referenced guidelines available for metals analyzed for the TSP fraction.

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1.0 INTRODUCTION

This report provides a summary of the ambient air monitoring activities for 2001, performed by AMEC Earth & Environmental Limited (AMEC) as part of the Muggah Creek Remediation Project.

During 2001, activities performed under the Muggah Creek Remediation Project that required ambient air monitoring included the following:

- collection of Tar Pond bulk sediment samples as part of the Technology Demonstration Program; and
- closure activities at the Sydney Landfill.

If unusual activities were occurring in the vicinity of the sampling stations, such as remedial activities at SYSCO, heavy vehicle traffic, ships in the harbour, refuelling of bulk fuel plants, etc., they were noted in the event of elevated reported analytical results.

This report provides summary including program descriptions, results and interpretation for the following air monitoring projects conducted by AMEC:

1. Portable Gas Chromatograph (GC) Programs performed in March and June of 2001;
2. Ambient air monitoring performed during the bulk sample collection of Tar Pond sediment for the Technology Demonstration Program;
3. Ambient air monitoring performed just prior to and during Landfill Closure Activities; and
4. Fixed Station Ambient Air Monitoring Program (AAMP) performed during the months of November and December of 2001.

1.1 OBJECTIVES

Table 1 provides a summary of objectives for the Ambient Air Monitoring performed during 2001.

TABLE 1 Objectives for Ambient Air Monitoring

Program	Objectives
Portable Gas Chromatograph Programs (March and June)	To investigate potential sources of previously reported anomalous benzene values in the vicinity of the Coke Ovens site in past air monitoring programs.
Technology Demonstration Program	To establish background conditions prior to the excavation of sediment from the South Tar Ponds and to assess impacts to the airshed during excavation activities.
Landfill Closure Project	To establish background conditions prior to Landfill closure activities starting and to assess impacts to the airshed during closure activities.
Fixed Station Ambient Air Monitoring Program	To determine the quality of the Sydney airshed in the vicinity of the Coke Ovens site and Tar Ponds during remedial activities at these two sites and during periods of no remedial activity, and compare the results to another location in Sydney remote to the Tar Ponds and Coke Ovens site and two other Canadian urban cities, in order to assess whether the Coke Ovens site and Tar Ponds are contributing contaminants to the airshed during periods of remedial activity and no activity.

2.0 PROGRAM DESCRIPTION

This section of the report provides a description of the four ambient air monitoring programs performed during 2001.

2.1 PORTABLE GAS CHROMATOGRAPH SAMPLING PROGRAMS

AMEC performed two portable Gas Chromatograph (GC) sampling and analysis programs in 2001, in order to identify potential sources of previously reported sporadic and anomalous volatile organic compounds (VOCs), particularly benzene, identified in earlier air monitoring events around the Coke Ovens site and other monitoring locations throughout the Sydney and Whitney Pier areas. In order to account for seasonal variability, sampling was performed in both spring (March) and summer (June). Numerous locations were selected for sampling, as shown on Figures 1 and 2, focusing on the Whitney Pier and Alexandra Street areas, as well as in the vicinity of the Domtar Tank area at the Coke Ovens site.

Samples were collected in the field using a lung sampler containing a 1-litre Tedlar bag. The samples, collected over a 2-minute period, were then transported back to the AMEC office for GC analysis of benzene and toluene. In March, analysis was performed with a portable gas chromatograph photoionization detector (GC-PID). For the June event, two types of equipment were used: a Voyager GC-PID and a Scentex gas chromatograph argon ionization detector (GC-AID).

The June event also included QA/QC sampling with evacuated canisters, concurrently with the portable GC sampling program, in order to compare the two methods. Evacuated canister QA/QC samples were also collected in March, following the GC sampling program. Evacuated canister sampling was performed in accordance with the USEPA Method TO14A, with analysis performed at the Philip Service Corporation (PSC) analytical laboratory in Burlington, Ontario.

2.2 TECHNOLOGY DEMONSTRATION PROGRAM

On September 18 to 21, 2001 sediment was collected from the South Tar Pond for technology demonstration purposes, as part of the Technology Demonstration Program. AMEC was retained to perform ambient air monitoring at three locations surrounding the area at which the collection of bulk sediment was being performed. Air monitoring was also performed in July and August prior to the bulk sediment collection activities, to establish background conditions.

The sampling program consisted of the collection of samples for analyses of polycyclic aromatic hydrocarbons (PAHs) and VOCs at three locations (Figure 3):

- Intercolonial Street (Air Program Location 5);
- DesBarres Street (Air Program Location 6); and
- SYSCO site next to the old hospital (Mobile Unit).

Background air samples were collected on July 27th and 31st, and August 2nd, 8th, and 15th. During the collection of bulk sediment samples in the South Pond, air samples were collected on September 18th, 19th, 20th and 21st. Air sampling was performed over 24-hour sampling periods beginning at midnight.



DETAIL "A"
DOMTAR TANK AREA
SAMPLING POINTS

ST. RITAS HOSPITAL / THOMAS ST.
SAMPLING POINTS



LEGEND

- SAMPLING POINTS
- COMTAR AREA
- SAMPLING POINTS
- ▲ POC WEATHER STATION
- ▲ MARCH 15 SAMPLING
- ▲ MARCH 16 SAMPLING
- ▲ MARCH 17 SAMPLING

SCALE



GC-PID SAMPLING PROGRAM
MUGGAH CREEK REMEDIATION PROJECT
MARCH 2001 SYDNEY, NOVA SCOTIA

GC-PID SAMPLING LOCATIONS



PROJECT NO.
T-01230

FIGURE 1



LEGEND	
	SAMPLE ID
	VOC CANISTER SAMPLE LOCATIONS (24 HOUR)
	PID WEATHER STATION
SCALE	
GC-PID SAMPLING PROGRAM MUGGAH CREEK REMEDIATION PROJECT JUNE 2001 SYDNEY, NEW SOUTH WALES	
GC-PID SAMPLING LOCATIONS	
	PROJECT NO 12233
	FIGURE 2





PAH compounds were sampled in accordance with the USEPA TO13A Method, using either Graesby Anderson or Tisch high volume samplers containing a glass-fibre filter with a polyurethane foam (PUF) sorbant backup medium. Environmental Services Laboratory (ESL) in Sydney performed sample media preparation and analyses. Initial and final flow checks were performed on each sampler for the 24-hour sampling period.

Sampling for VOCs was performed in accordance with the USEPA TO14A Method, using evacuated stainless steel canisters equipped with a flow restrictive device (cantroller). PSC in Burlington, Ontario performed the VOC analysis.

During the September 20th sampling event, a delivery truck that was leaking a petroleum product arrived during the period in which the excavation activities were being performed. The leak occurred approximately 200 m upwind of the SYSCO site sampling location, and was promptly cleaned up. To assess possible contributions from the spill to the SYSCO site sampling location, a second VOC sampler was set up after the spill was cleaned up, in order to compare the two sets of air samples.

2.3 LANDFILL CLOSURE PROJECT

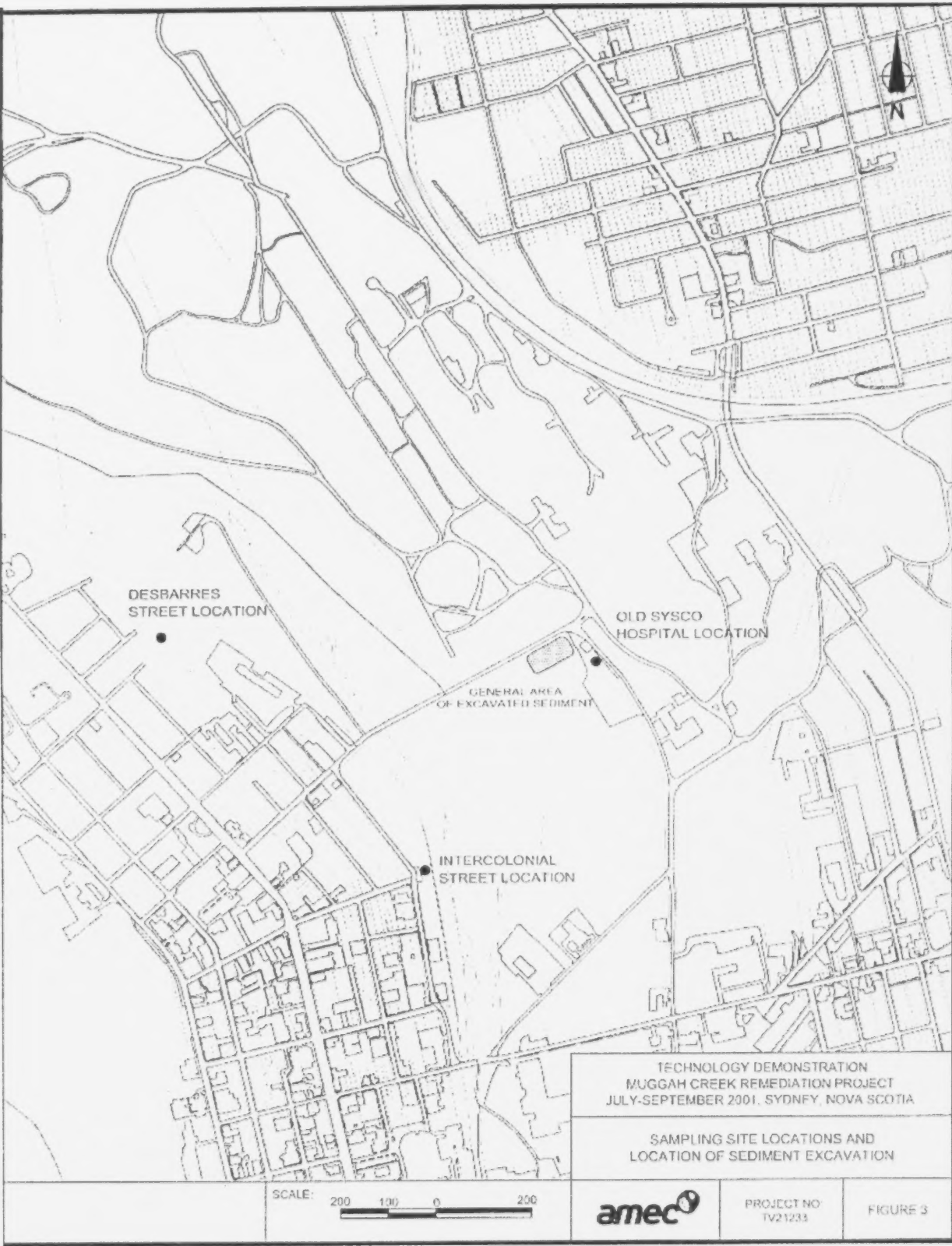
AMEC was retained to perform ambient air sampling for total suspended particulate (TSP) at three locations during the Municipal Landfill Closure Project. TSP was chosen over PM₁₀ because TSP is regulated by the Province of Nova Scotia.

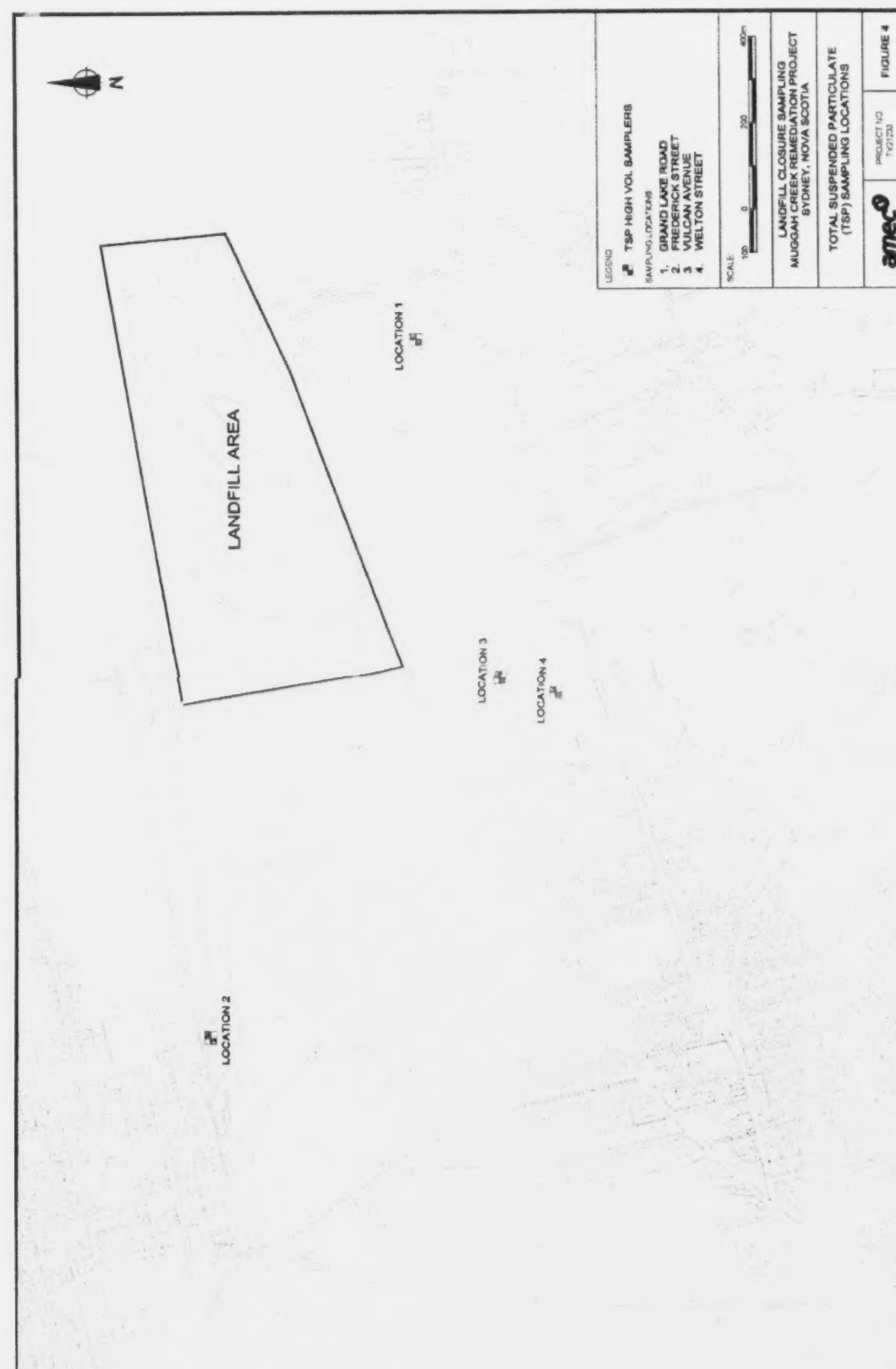
The sampling protocol for TSP was in accordance with the Environment Canada Method for the Measurement of Suspended Particulate in the Atmosphere, using Tisch high volume samplers. Calibration of each sampler was performed with orifice resistance plates and a water manometer. Initial and final flow checks were performed on each sampler for the 24-hour sampling period. Analyses were performed at ESL in Sydney.

Air monitoring was performed both prior to closure activities and during closure activities to establish the background conditions and to assess if the airshed was impacted by the activities. Refer to Figure 4 for a plan view of TSP sampling locations. The sampling locations were chosen based on location of residential neighbourhoods (desirable to sample between landfill and residential areas) and power availability. The sample dates and locations are as follows.

Background Dates:	August 21 st , 22 nd and 23 rd
Locations:	581 Grand Lake Road, Frederick Street and Vulcan Avenue
Active Dates:	September 14 th , 20 th and 26 th October 2 nd , 10 th , 16 th and 22 nd
Locations:	581 Grand Lake Road, Frederick Street and 275 Welton Street

Following seven sampling events during activities at the municipal landfill, it was decided not to continue with further sampling events because the results were consistently well below the Nova Scotia regulation of 120 µg/m³. The Nova Scotia Department of Environment & Labour concurred with this decision.





2.4 2001 FIXED STATION AMBIENT AIR MONITORING PROGRAM

This section provides a summary of the methodology used in the Fixed Station Ambient Air Monitoring Program (AAMP) for the months of November and December 2001.

In November 2001, the Fixed Station AAMP was implemented as part of the Sydney Muggah Creek Remediation Project to monitor ambient air quality in the Sydney airshed prior to and during proposed remedial activities to be performed on the Tar Ponds and Coke Ovens site. The monitoring is performed to determine whether or not there are any long-term and/or short-term effects on human health and the environment from the proposed remedial activities, and to assess impacts to the airshed from the Tar Ponds and Coke Ovens site during periods of inactivity.

The Fixed Station AAMP consists of ambient air sampling in the vicinity of the Coke Ovens and Tar Ponds, and elsewhere in Sydney to obtain background concentrations, for the following:

- particulate matter less than 10 microns in diameter (PM₁₀) at 3 fixed locations;
- particulate matter less than 2.5 microns in diameter (PM_{2.5}) at 3 fixed locations; and
- metals, PAH and VOC parameters at six fixed locations.

Some of these chemical parameters were chosen because they are considered contaminants of concern associated with the Tar Ponds and Coke Ovens site, and many are regulated, as discussed in Section 2.6 (CBEG, 1997; JWEL, 1998). In addition, other parameters were reported if they were part of the standard laboratory package offered. Table 2 provides a detailed list of PAH, metal and VOC parameters analyzed.

TABLE 2 Ambient Air Monitoring Program Parameters Analyzed

POLYAROMATIC HYDROCARBONS			
Naphthalene	Phenanthrene	Benzo(a)anthracene	Indeno(1,2,3cd)pyrene
Acenaphthylene	Anthracene	Chrysene	Dibenzo(a,h)anthracene
Acenaphthene	Fluoranthene	Benzo Fluoranthene	Benzo(g,h,i)perylene
Fluorene	Pyrene	Benzo(a)pyrene	
METALS			
Aluminum	Cobalt	Molybdenum	Vanadium
Antimony	Calcium	Nickel	Zinc
Arsenic	Copper	Selenium	Strontium
Barium	Iron	Silver	Magnesium
Beryllium	Lead	Sodium	Potassium
Boron	Lithium	Thallium	Sulphur
Cadmium	Manganese	Tin	
Chromium	Mercury	Uranium	
VOLATILE ORGANIC COMPOUNDS			
Dichlorodifluoromethane	1,1-Dichloroethane	cis-1,2-Dichloropropene	1,3,5-Trimethylbenzene
Chloromethane	1,2-Dichloropropane	trans-1,3-Dichloropropene	1,2,4-Trimethylbenzene
Halocarbon 114	Dichloromethane	Trichloroethene	1,3-Dichlorobenzene
Vinyl chloride	Chloroform	Tetrachloroethene	1,4-Dichlorobenzene
Chloromethane	1,1,2,2-Tetrachloroethane	Carbon tetrachloride	1,2-Dichlorobenzene
1,2-Dichloroethane	Halocarbon 113	Ethylene dibromide	1,2,4-Trichlorobenzene
Bromomethane	1,1,1-Trichloroethane	Ethylbenzene	Hexachlorobutadiene
Trichlorofluoromethane	1,1,2-Trichloroethane	m&p-Xylene	Chlorobenzene
1,1-Dichloroethene	Toluene	o-Xylene	Styrene
cis-1,2-Dichloroethene	Benzene		



Table 3 provides a summary of the six fixed sampling locations and parameters to be sampled at each location. In addition, there is a mobile station available, which can be moved around depending on whether samples from other locations are warranted during periods of remedial activity at the Tar Ponds and Coke Ovens site. In consideration that no remedial activities occurred during November and December at the two sites, the mobile station was not used in 2001.

TABLE 3 Ambient Air Monitoring Program Sampling Locations and Parameters Analyzed							
Parameter	Victoria Road STATION 1	Frederick Street STATION 2	Henry Street STATION 3	Kings Road STATION 4	Intercolonial Street STATION 5	DesBarres Street STATION 6	Mobile Station STATION 7
PM _{2.5}			•	•	•		•
PM ₁₀	•	•				•	•
PAH	•	•	•	•	•	•	•
VOC	•	•	•	•	•	•	•
Metals	•	•	•	•	•	•	•

Refer to Figure 5 for the sampling locations. The sampling frequency for the program follows a 6-day National Air Pollution Surveillance (NAPS) schedule during periods when activity is occurring at the Tar Ponds and/or Coke Ovens site. Sampling during periods of non-activity will be performed on a 12-day schedule falling on NAPS days. The sampling duration for each event is 24-hours (midnight to midnight).

Although no activities were occurring at the Coke Ovens site nor Tar Ponds during November and December 2001, sampling was performed every six days on November 21st and 27th, and December 3rd, 9th, 15th, followed by a 12 day sampling event on December 27th.

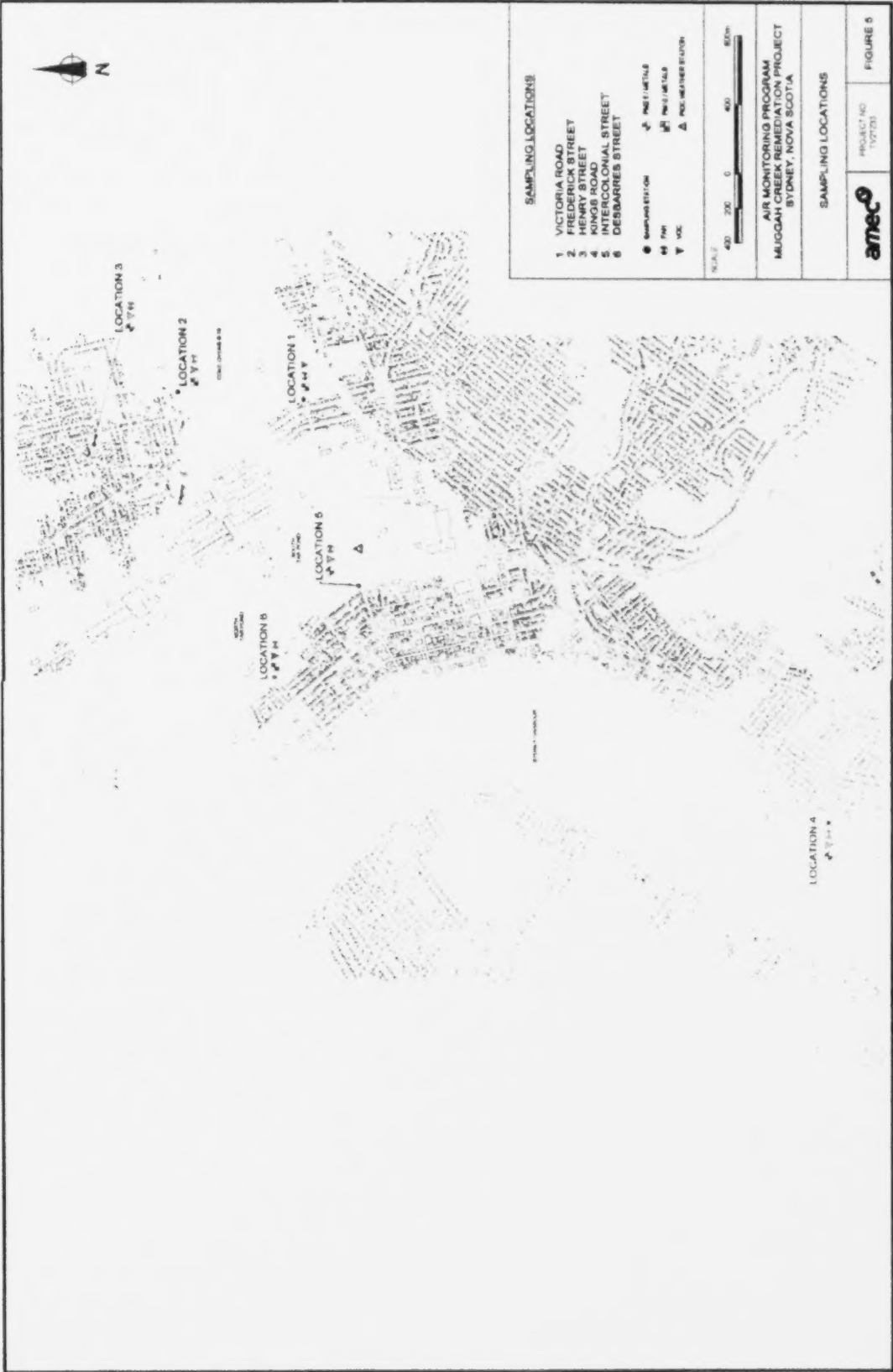
It should be noted that in any long-term ambient air quality monitoring program, NAPS is designed to account for meteorological and temporal changes. Nonetheless, if there were exceedances to 24-hour criteria, meteorological influences such as wind direction are examined. Weather information for the program during the month of November and December was obtained from the project weather station located at the former Public Information Display Centre (PIDC) site off of Terminal Road, along with data from the Environment Canada weather station located at the Sydney Airport.

2.4.1 Summary of Methods and Equipment

The field program consists of sampling for PM₁₀, PAHs, and metals using high volume sampling equipment, PM_{2.5} and metals using low volume sampling equipment, and VOCs using stainless steel evacuated canisters. The following provides a summary of methods and equipment employed.

2.4.1.1 PM_{2.5} and Metals

Sampling for PM_{2.5} was conducted in accordance with the United States Environmental Protection Agency (USEPA) Reference Method for the Determination of Fine Particulate Matter as PM_{2.5} in the Atmosphere (40 CFR, Subchapter C, Part 50, Appendix L). Sampling was performed with the BGI PQ-200 PM_{2.5} sampling system. The media used to capture PM_{2.5} and metals were 47 mm polytetrafluoroethylene (PTFE) Teflon filters. Analyses were performed at ESL in Sydney. Refer to Table 2 for a list of metals parameters analyzed.





2.4.1.2 PM₁₀ and Metals

Sampling for PM₁₀ was performed in accordance with the USEPA Reference Method for the Determination of Particulate Matter as PM₁₀ in the Atmosphere (40 CFR, Part 50, Appendix M). All sampling was performed with either Graesby Anderson or Tisch high volume samplers. Initial and final flow checks were performed during the 24-hour sampling period. The medium used to capture PM₁₀ and metals is quartz filters. ESL performed the sample media preparation and analyses.

2.4.1.3 PAHs

PAH compounds were sampled in accordance with the USEPA TO13A Method. The USEPA TO13A Method samples for both the vapour/aerosol and particulate forms of PAHs. All sampling was performed with either Graesby Anderson or Tisch high volume samplers. Initial and final flow checks were performed on each sampler during the 24-hour sampling period. The medium used to capture PAH compounds was a glass-fibre filter with a polyurethane foam (PUF) sorbent backup. ESL performed sample media preparation and analyses.

2.4.1.4 VOCs

Sampling for VOCs was performed in accordance with the USEPA TO14A Method. An evacuated stainless steel canister was used to collect a sub-atmospheric (pressure) sample. A flow restrictive device (cantroller) was employed to acquire the samples over a 24-hour period. The evacuated canisters were transported to the PSC laboratory in Burlington, Ontario for analyses.

2.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

2.5.1 Portable Gas Chromatograph Sampling Programs QA/QC

Portable Gas Chromatograph Sampling Program QA/QC consisted of evacuated canister duplicates and a field blank during both the March and June events and a comparison of canister and portable GC sampling methods for the June event. In the March sampling event, PSC analyzed the two duplicates and field blank. In the June sampling event, Environment Canada in Ottawa analyzed one of the field duplicates (the other duplicate sample was analyzed at PSC) and the field blank.

2.5.2 Technology Demonstration Program QA/QC

Program QA/QC included the collection of field blanks and duplicates for both the VOC canisters and the PAH samplers. A VOC duplicate and field blank and a PAH duplicate were performed on August 2nd at the Intercolonial Street sampling location. The PAH field blank was conducted on July 31st at the Intercolonial Street location.

2.5.3 Landfill Closure Project QA/QC

There were no QA/QC samples collected for the Landfill Closure Project.



2.5.4 2001 Fixed Station Ambient Air Monitoring Program QA/QC

QA/QC procedures, including validation of the data, were implemented throughout the months of November and December of 2001. Refer to Table 4 for a summary of QA/QC samples performed over these two months.

TABLE 4 Ambient Air Monitoring Program QA/QC Sampling for November and December 2001

Parameter	November 21		November 27		December 3	
PAH	Kings Road	FB ⁽¹⁾	DesBarres Street	FB	Frederick Street	DUP ⁽²⁾
VOC	Victoria Road	FB	DesBarres Street	FB	Henry Street	DUP
PM ₁₀ / Metals	DesBarres Street	FB	Victoria Road	FB	Victoria Road	DUP
PM _{2.5} / Metals	NA	NA	Intercolonial Street	FB	Intercolonial Street	DUP
Parameter	December 9		December 15		December 27	
PAH	Frederick Street	FB	DesBarres Street	FB	Frederick Street	DUP
VOC	Kings Road	FB	Intercolonial Street	FB	Victoria Road	DUP
			Victoria Road	DUP		
PM ₁₀ / Metals	Frederick Street	FB	Victoria Road	FB	Intercolonial Street	DUP
PM _{2.5} / Metals	Intercolonial Street	FB	Kings Road	FB	NA ⁽³⁾	NA

Note:

- (1) FB denotes field blank sample
- (2) DUP denotes duplicate sample
- (3) NA denotes not applicable; no QC sample collected for PM_{2.5} on that date.

Data validation included review and evaluation of the following elements:

1. Sampling records
2. Chain of Custody documentation
3. Holding times
4. Canister certification analyses (VOC samples)
5. Canister pressure after sampling and upon laboratory receipt (VOC samples)
6. Method blanks
7. Laboratory spike samples
8. Matrix spike samples
9. Sample duplicate analyses
10. Internal Standard recoveries (VOCs)
11. Surrogate recoveries (PAHs)
12. Field blanks

2.6 REGULATORY FRAMEWORK

A review of existing Nova Scotia Ambient Air Criteria determined that of the 85 parameters analyzed, only TSP is regulated (120 µg/m³) in the province for a 24-hour period. The Province of Ontario does provide ambient air quality criteria (AAQC) for many of the program parameters and these have been included in the tables for this section.

In addition, the Canadian Environmental Protection Agency (CEPA) provides a Canada Wide Standard (CWS) of 30 µg/m³ for PM_{2.5}. CEPA does not provide a CWS for PM₁₀. Until a CWS is developed for PM₁₀, CEPA suggests the use of criteria developed in other jurisdictions. For the Sydney Ambient Air Program, a 24-hour criterion of 50 µg/m³ for PM₁₀ has been applied, which is the criterion being used in Ontario and British Columbia. The exception is the monitoring locations at the perimeter of the Coke Ovens site, where a 24-hour criterion of 25 µg/m³ for PM₁₀ has been applied during periods of activity at the site, as developed in the Interim Separation Zone study. In consideration that there were no activities in the AAMP for



November and December results at the Coke Ovens site, the $25 \mu\text{g}/\text{m}^3$ criteria is not applicable. However, comparisons were made anyway to determine whether during periods of inactivity, there are any criteria exceedances at the perimeter of the Coke Ovens site and elsewhere in Sydney for background reference in the event exceedances are reported during periods of activity.

In the fall of 2000, AMEC developed Interim Separation Zone Criteria for use during the decommissioning of surface structures at the Coke Ovens site (AMEC, 2000). These criteria assume short term exposure during demolition activities for the contaminants of concern found at the Coke Ovens site. The Interim Separation Zone Criteria were derived using conservative exposure assumptions and toxicity factors accepted and used by regulatory authorities and advisory agencies throughout Canada and the United States. The following criteria are contained in the report titled "Development of Interim Separation Zones, Former Coke Ovens site, Sydney, Nova Scotia".

<u>Parameter</u>	<u>Short Term Criteria</u>
Benzene	$7 \mu\text{g}/\text{m}^3$
Toluene	$760 \mu\text{g}/\text{m}^3$
Ethylbenzene	$200 \mu\text{g}/\text{m}^3$
Xylenes	$36 \mu\text{g}/\text{m}^3$
Benzo(a)pyrene	$22.4 \mu\text{g}/\text{m}^3$
Naphthalene	$3 \mu\text{g}/\text{m}^3$
Methylene Chloride	$200 \mu\text{g}/\text{m}^3$
Arsenic	$0.0034 \mu\text{g}/\text{m}^3$
Beryllium	$0.02 \mu\text{g}/\text{m}^3$
Lead	$0.83 \mu\text{g}/\text{m}^3$
Manganese	$0.04 \mu\text{g}/\text{m}^3$
Asbestos	$0.003 \mu\text{g}/\text{m}^3$
PM ₁₀	$25 \mu\text{g}/\text{m}^3$

It is noted that the criteria for benzene and methylene chloride are very conservative values. Periodic exceedances of $7 \mu\text{g}/\text{m}^3$ for benzene as high as $86.4 \mu\text{g}/\text{m}^3$ and periodic exceedances of $200 \mu\text{g}/\text{m}^3$ as high as $2000 \mu\text{g}/\text{m}^3$ for methylene chloride are considered acceptable based on short-term exposure risk to human health, as indicated in the Interim Separation Zone study report. It should also be noted that the Interim Separation Zone Criteria were developed specific to the Coke Ovens site and therefore should only be applied to monitoring stations at the perimeter of the Coke Ovens site during periods of remedial activity at the site. Although comparisons can be made, the criteria should not be applied to locations outside the Coke Ovens site (*i.e.*, the DesBarres Street, Intercolonial Street, Kings Road and Henry Street locations), nor for locations along the Coke Ovens perimeter during periods of no activity.



3.0 AIR QUALITY - AN OVERVIEW

This section of the report provides a general description of physical setting, general climatology over a recent 30-year period (climate normals) and meteorological conditions during the monitoring events performed in 2001.

3.1 PHYSICAL SETTING

The Coke Ovens site is located on the east side of Victoria Road in downtown Sydney. The Site is bordered to the east by the Cape Breton Regional Municipal Landfill; to the west by Victoria Road, with industrial operations (SYSCO) predominant at the north end and residential land use at the south end of Victoria Road; to the south by residential properties along Vulcan Avenue; and to the north by the DEVCO rail line and residential properties along Frederick Street, Curry's Lane and Tupper Street.

The Site is situated on a relatively flat- bottomed, westerly-sloping, 500-metre wide valley. The valley is bounded to the north and south by topographic highs rising 20 to 30 m at a 5 to 10 % gradient. Coke Ovens Brook flows westward at a gradient of less than 1% through the centre of the valley. Frederick Street Brook from the north and Cagney Brook from the south flow into Coke Ovens Brook before discharging to the South Tar Pond.

The Tar Ponds comprise the South Tar Pond and the North Tar Pond, separated by a dam with a funnel and gate system to control the flow of water from the South Tar Pond to the North Tar Pond. Collectively, the Tar Ponds encompass an area of approximately 33 hectares. The North Tar Pond is a tidal estuary linking the South Tar Pond to Sydney Harbour. For over 80 years, the Coke Ovens waste from the Coke Ovens site has ended up in the Tar Ponds.

3.2 GENERAL CLIMATOLOGY

The area is situated within a cool, temperate climatic zone which is influenced by the marine environment and prevailing westerly winds. Winters are traditionally cold with frequent snowfall. Spring is generally late (early May), cool, and cloudy. Summers are historically short in duration, warm, and somewhat humid. Annual average records of days with freezing precipitation, fog, and thunderstorms are reported to be 19, 78, and 9 days, respectively.

3.2.1 30-Year Climate Normals

The meteorological elements that have the most direct and significant effects on the distribution of air emissions are wind speed and direction, solar radiation, stability, and precipitation. Published climate normals (30-year averages) are available from Environment Canada for the principal weather station located at the Sydney Airport, for the period 1951-1980 for the wind data and 1961-1990 for the remaining meteorological data.

Temperature normals from the Sydney Airport indicate that the daily mean temperature is 5.5°C . The annual mean daily maximum temperature is 10°C and the annual mean daily minimum temperature is 0.9°C .



The total annual mean for precipitation for the Sydney station is 1480.1 mm. The total annual mean is defined as the total water equivalent of rainfall plus snowfall. The total mean snowfall is 329.5 cm, which equates to 329.5 mm of rainfall (*i.e.*, 1 cm snowfall equals 1 mm rainfall). Figure 6 presents a wind rose diagram for the Sydney Airport Station. The wind rose provides information on wind frequency, direction and speed for each sampling day. The length of each bar for a direction indicates the percent of time the wind blows from that direction. The wind direction is defined as that from which the wind is blowing (*i.e.*, a north wind blows from the north).

Winds are predominantly from the south to west quadrant. During summer months, winds are predominantly from the south and southwest directions. In winter, winds frequently move from the northwest and north directions. During storm events, southerly winds (*i.e.*, southwest, southeast, and south) tend to dominate. Winds from the easterly directions have the lowest frequency of occurrence.

The average annual wind speed (all directions) is 20 km/hr. Winds are generally strongest in winter. Maximum hourly speeds of 97 km/hr have been recorded in October, December, and March with maximum gust speeds of 161 km/hr documented in December at the Sydney Station.

3.3 2001 CLIMATOLOGICAL CONDITIONS

This section provides a summary of climatological conditions during the 2001 Coke Ovens AAMP. All meteorological information was obtained from the PIDC weather station located off Terminal Road at the south end of the Tar Ponds.

The daily mean temperature for 2001 was 6.9°C. The average wind speed was 15.1 km/hr. The maximum wind speed was 63.0 km/hr. The average relative humidity was 76.2 %.

Figure 7 presents a wind rose diagram for the PIDC Station for 2001. Winds were predominately from the south (15.5 %) and south-southwest (13.6 %) directions. A comparison of the wind rose diagram for 2001 with the wind rose (Figure 6) developed using 30-year climate normal (1951-80) indicates that winds are prevailing from the southwest quadrants for both periods. Winds occurred from the northerly and westerly directions less frequently at the PIDC site during 2001, when compared to the 30-year climate normals from the Sydney airport station.

The following sections provide a summary of meteorological conditions during each of the 2001 air monitoring programs.

3.3.1 Meteorological Conditions: Portable GC Sampling Program

Table 5 provides a summary of meteorological conditions for the portable GC programs performed in March and June 2001.

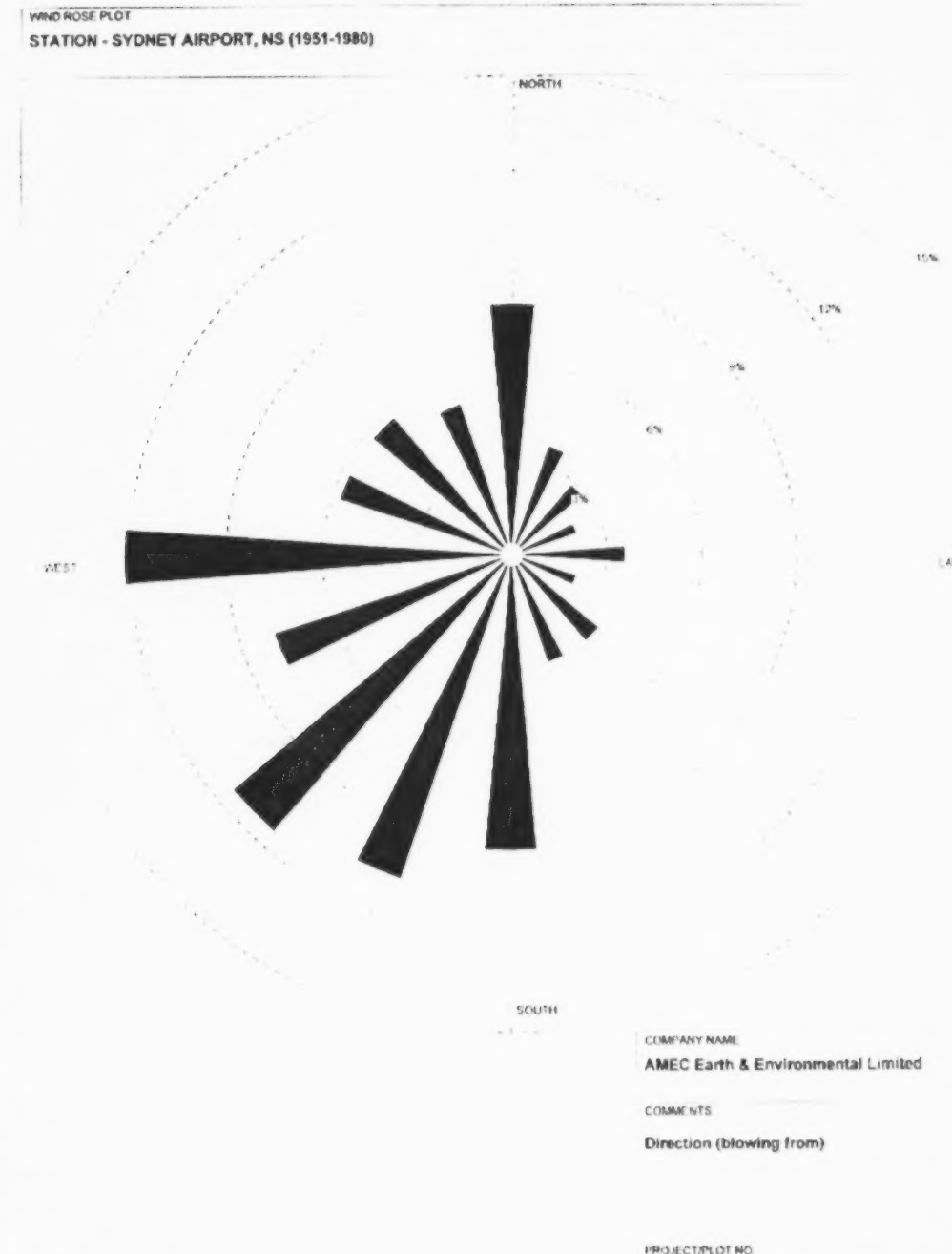
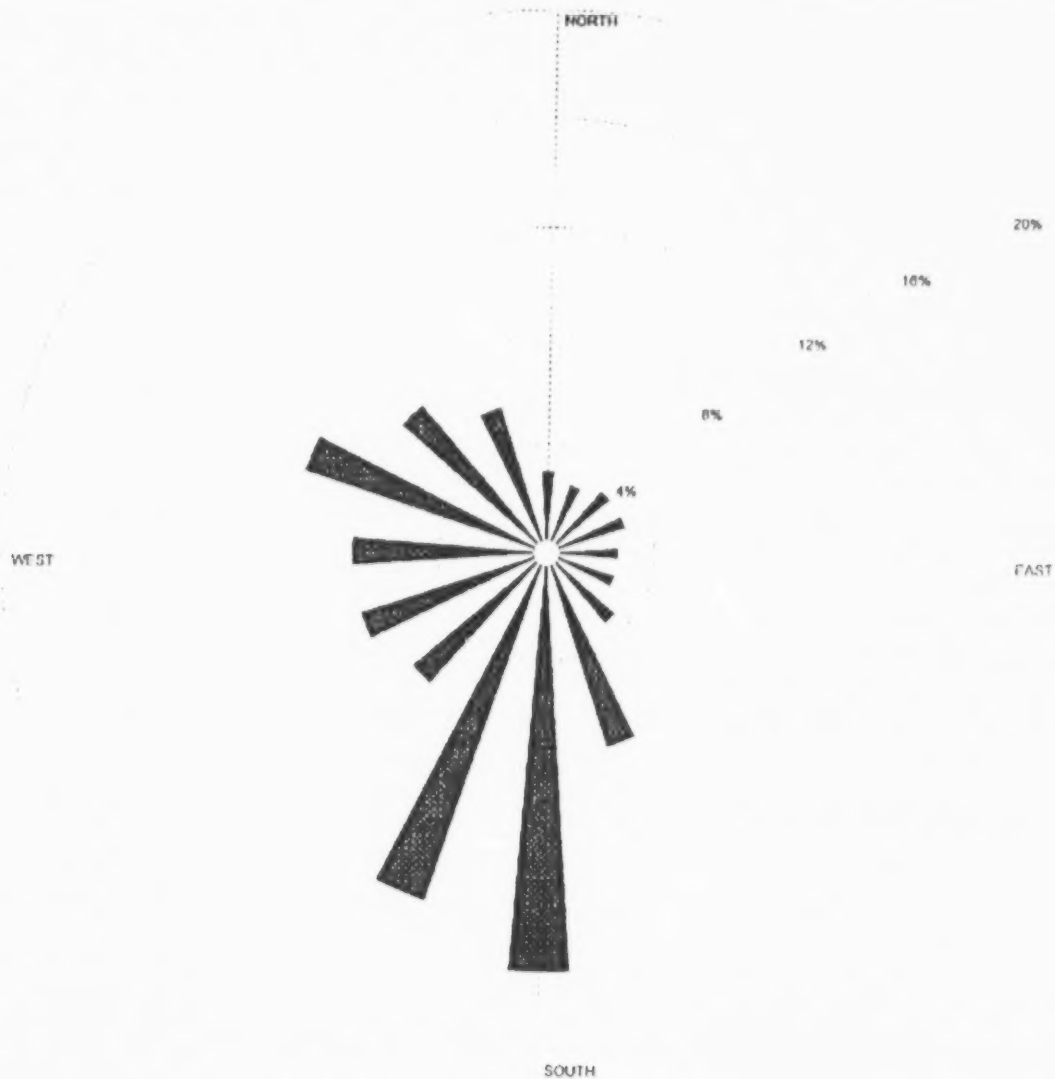


FIGURE 6

WIND ROSE PLOT

PIDC STATION, Sydney, NS (2001 Annual Wind Rose)



COMPANY NAME

AMEC Earth Environmental

COMMENTS

Direction (blowing from)

PROJECT/PLOT NO

FIGURE 7

TABLE 5 Portable GC Sampling Program Meteorological Conditions

Winter Program	March 15	March 16	March 17	March 25
Prevailing Direction	WSW	WSW	WSW/W	S/SW
Wind Speed (km/hr)	19.3	23.2	13.8	20.9
Temperature (°C)	0.9	-0.7	1.2	1.9
Summer Program	June 6	June 7	June 8	June 11
Prevailing Direction	SSE/S/NNW	WNW	WNW	WNW
Wind Speed (km/hr)	10.4	9.9	19.5	8.4
Temperature (°C)	10.0	11.5	11.8	12.2

3.3.2 Meteorological Conditions: Technology Demonstration Program

Table 6 provides a summary of meteorological conditions that occurred during the background sampling and sampling during the excavation of sludge for the Technology Demonstration Program.

TABLE 6 Technology Demonstration Program Meteorological Conditions

Background	July 27	July 31	August 2	August 8	August 15
Prevailing Direction	NNW	ENE	SSW	W	S
Wind Speed (km/hr)	16.3	9.9	11.3	13.9	6.6
Temperature (°C)	14.4	17.5	21.4	21.7	17.8
Excavation Activities	September 18	September 19	September 20	September 21	
Prevailing Direction	SSE	NNW	SSE	SSE	
Wind Speed (km/hr)	8.8	27.1	9.6	12.1	
Temperature (°C)	14.2	13.9	11.1	14.5	

3.3.3 Meteorological Conditions: Landfill Closure Project

Table 7 provides a summary of meteorological conditions that occurred during the background sampling and sampling during the Landfill Closure activities.

TABLE 7 Landfill Closure Project Meteorological Conditions

TABLE 7 Landfill Closure Project Meteorological Conditions							
Background	August 21		August 22		August 23		
Prevailing Direction	SE		SSW		SSW		
Wind Speed (km/hr)	9.8		10.0		9.7		
Temperature (°C)	19.0		20.6		22.5		
Active	September 14	September 20	September 26	October 2	October 10	October 16	October 22
Prevailing Direction	NNW	SSE	ESE	SSW	SSW/SW	SW	W
Wind Speed (km/hr)	20.6	9.6	9.7	17.7	11.6	10.2	20.6
Temperature (°C)	15.4	11.1	17.3	14.30	9.7	14.3	11.1

3.3.4 Meteorological Conditions: 2001 Fixed Station AAMP

Table 8 provides a summary of meteorological conditions that occurred during the months of November and December 2001.

TABLE 8 Fixed Station AAMP Meteorological Conditions November and December Events

Date	November 21	November 27	December 3	December 9	December 15	December 27
Prevailing Direction	WNW	N/NNE	SSW	W	NW	W
Wind Speed (km/hr)	20.1	7.6	7.1	10.0	20.3	17.0
Temperature (°C)	3.1	5.3	2.8	-0.6	0.1	1.4



4.0 PROGRAM RESULTS

The following sections provide a summary of results for the four ambient air monitoring programs performed during 2001.

4.1 PORTABLE GC SAMPLING PROGRAM RESULTS

This section provides a summary of air sampling results for the March and June portable gas chromatography sampling programs.

The March portable gas chromatography program consisted of obtaining samples from within communities surrounding the Former Coke Ovens site and in snow pore space. Table 9 provides a summary of sampling locations and results for samples obtained within the community.

TABLE 9 March 2001 Portable GC Sampling Program Results in Residential Areas

Sample	Location	Benzene (µg/m³)	Toluene (µg/m³)	Sample	Location	Benzene (µg/m³)	Toluene (µg/m³)
AA#1	200 French Street	ND ⁽¹⁾	3.8 ⁽²⁾	AB#19	Upper Brooks Street	<3.2	< 5.0
AA#2	Lingan & MacCuish	ND	ND	AB#20	Upper Lingan Road	ND	ND
AA#3	Lingan & Gunn	ND	ND	AB#21	Lingan & Eastmount	ND	ND
AA#4	Lingan & Road (bottom)	ND	ND	AB#22	Gibbons & Eastmount	ND	ND
AA#7	Upwind Coke Ovens	ND	ND	AB#23	Gas Station	89	106
AA#8	Downwind of Coke Ovens	ND	ND	AB#24	Jamison Street	<3.2	ND
AB#9	Mid Frederick Street	ND	ND	AB#25	Lingan & Jamison	ND	ND
AB#10	Upper Frederick	ND	ND	AB#26	Church & St. Lawrence	ND	ND
AB#11	Lingan & Maloney	ND	ND	AB#27	Catherine & Bison	ND	3.8 ⁽²⁾
AB#12	Mid Maloney	ND	ND	AB#28	Harbourview School	ND	ND
AB#13	End of Maloney	ND	ND	AB#29	West & Webster	ND	ND
AB#14	Maloney Street (trail)	ND	ND	AB#30	Victoria Road & Webster	ND	ND
AB#15	Shendale & Gunn	ND	ND	AC#1	26 Thomas Street	ND	ND
AB#16	End of Gunn Street	ND	ND	AC#2	St. Rita's Hospital	ND	ND
AB#17	MacDonald Court	ND	ND	AC#3	Lower Vulcan Avenue	ND	ND
AB#18	Mid Brooks Street	6.4	ND	AC#4	Upper Vulcan Avenue	6.4	ND

Note:
(1) ND denotes Not Detected.
(2) Reporting limits, based on low calibration standard were 3.2 µg/m³ for benzene and 5 µg/m³ for toluene. Reported values are estimated below instrument calibration.

Benzene results ranged from non-detect (29 out of 34 samples) to 89 µg/m³ at the Victoria Road Gas Station. Toluene results ranged from non-detect (30 out of 34 samples) to 106 µg/m³ at the Victoria Road Gas Station.

Samples were collected from the pore space in snow from locations around the Domtar Tank in order to determine whether emissions from the potentially contaminated soil could be detected. Releases from the soil would collect in the snow pore spaces and the initial dilution would be significantly less than emissions into ambient air, allowing for a greater chance of detecting site-related releases than would be possible by ambient air sampling. Table 10 provides a summary of sample results obtained in March 2001 from the pore space of snow surrounding the Domtar Tank.



TABLE 10 March 2001 Portable GC Sampling Program Domtar Area Analyses of Snow Pore Space

Sample	Location	Benzene (µg/m³)	Toluene (µg/m³)	Sample	Location	Benzene (µg/m³)	Toluene (µg/m³)
S#1	South Domtar Area	ND ⁽¹⁾	ND	S#6	North Domtar Area E	77	ND
S#2	Mid-Domtar Area W	ND	ND	S#7	Domtar Tank N	89	ND
S#3	Mid-Domtar Area E	33	ND	S#8	Domtar Tank W	33	ND
S#4	North Domtar Area W	ND	ND	S#9	Domtar Tank S	44	ND
S#5	North Domtar Area	ND	ND	S#10	Domtar Tank E	29	ND

Note:
(1) ND denotes Not Detected
Reporting limits, based on low calibration standard, were 3.2 µg/m³ for benzene and 19 µg/m³ for toluene

Benzene ranged from non-detect (4 out of 10 samples) to 89 µg/m³ obtained from the pore space of snow surrounding the Domtar Tank. These results should be taken as qualitative confirmation that fugitive emissions from soil in the area around the Domtar release benzene into the ambient air, but no estimation of the impact on air quality can be made from this limited exercise. Toluene was not detected.

Table 11 provides a summary of evacuated canister VOC results for samples collected within a week of the portable GC sampling program. Since these samples were not collected on the same day as the field GC measurements, results cannot be directly compared.

TABLE 11 March 2001 VOC Results for Evacuated Canister Samples Collected After Portable GC Sampling Program

Parameter	MDL ⁽³⁾ (µg/m³)	Duplicate #1 Fenceline North of Domtar Cell March 25 (µg/m³)	Duplicate #2 Fenceline North of Domtar Cell March 25 (µg/m³)	200 French Street March 25 (µg/m³)	Field Blank 200 French Street March 25 (µg/m³)	Ontario Ambient Air Quality 24-hour Criteria (µg/m³)	Interim Separation Zone Criteria ⁽⁶⁾ (µg/m³)
Acetone	0.48	121	136	282	21.49	48,000	na
Dichlorodifluoromethane	0.71	1.6	2.77	3.27	ND	500,000	na
Bromomethane	0.35	13.7	4.58	123	0.83	na ⁽⁵⁾	na
Trichlorofluoromethane	0.79	ND ⁽⁴⁾	0.91	3.88	ND	6000	na
Dichloromethane	0.69	ND	ND	9.96	3.11	1765	na
Toluene	0.49	0.84	1.38	64.4	0.92	2000	760
Benzene	0.54	1.83	ND	2.86	ND	na	7
Trichloroethene	0.70	ND	ND	2.08	ND	28,000	na
Tetrachloroethene	1.02	ND	ND	1.74	ND	400	na
Ethyl Benzene	0.65	ND	ND	21.9	ND	4000 ⁽¹⁾	200
m&p-Xylene	0.87	ND	ND	75.1 ⁽⁷⁾	ND	2300 ⁽²⁾	36
o-Xylene	0.82	ND	ND	24.5	ND	na	na
1,3,5-Trimethylbenzene	0.79	ND	ND	5.75	ND	na	na
1,2,4-Trimethylbenzene	0.84	ND	ND	5.75	ND	1,000	na
Styrene	0.81	ND	ND	3.03	ND	na	na

Notes:
(1) Value represents a 1-hour guideline.
(2) Value represents o,m,p xylenes.
(3) MDL denotes method detection limit.
(4) ND denotes not detected.
(5) na denotes not available.
(6) Criteria obtained from the AGRA Interim Separation Zone document, 2000.
(7) Shading denotes criteria exceedance.

Currently, there are no ambient air regulations or guidelines for Nova Scotia for the VOC parameters contained in Table 11. The Province of Ontario provides ambient air quality criteria (AAQC) for some parameters identified in Table 11 and these guidelines are included for comparison with the measured concentrations. There were no exceedances of the Ontario AAQC. The sample taken at French Street reported several VOC compounds including



benzene and toluene. Benzene and toluene were also detected at the Coke Ovens site fenceline, at much lower concentrations. Xylenes were detected at the French Street location at concentrations, which exceeded the Interim Separation Zone Criterion of $36 \mu\text{g}/\text{m}^3$.

Table 12 contains results for the Portable GC Sampling Program performed in June 2001. Air sampling was performed at 28 locations. At most locations only one sample was taken. At 200 French Street, which was also sampled in March, three samples were collected over the six-day sampling period. Five samples were collected at the Domtar Cell North location, four samples at the Domtar slag ramp location, two samples at the Coal Pile and two samples at the Cooling Tower Grids. In addition to 200 French Street, samples were taken at the Ligan and Gunn location and the Ligan and Maloney location in March.

Benzene results reported mostly non-detect values (38 out of 48 samples) and trace values at the method detection limit of either $10 \mu\text{g}/\text{m}^3$ or $14 \mu\text{g}/\text{m}^3$ at seven locations, including 200 French Street on two out of three occasions, Ferry Street Weir, Ferry/Intercolonial Street intersection, Victoria Road Overpass, Kings Road/Argyle Street intersection, and one out of four occasions at the Domtar Slag Ramp location. Previously in March, benzene was not detected at 200 French Street in the GC analysis.

A benzene value of $9 \mu\text{g}/\text{m}^3$ was reported on one out of five occasions at the Domtar Cell North location. At the Benzol Plant location, a benzene value of $16 \mu\text{g}/\text{m}^3$ was reported. At the gas station along Victoria Road, a benzene value of $25 \mu\text{g}/\text{m}^3$ was reported.

Benzene was not detected at the Cooling Tower grids nor at the coal pile in the Coke Ovens site. Benzene was also not detected at two bulk fuel facilities.

Toluene results reported mostly non-detect values (27 out of 48 samples) and trace values at the method detection limit of $4 \mu\text{g}/\text{m}^3$ at eight locations, including the Ferry Street Weir location, the Domtar Cell North location, Victoria Road Pharmacy parking area, Upper Frederick Street, the Domtar Slag ramp location, Irving Oil bulk fuel plant, Victoria Road overpass, and 200 French Street.

Toluene values of 7 – $113 \mu\text{g}/\text{m}^3$ were reported at several locations including 200 French Street ($26 \mu\text{g}/\text{m}^3$), two autobody shops (15 and $48 \mu\text{g}/\text{m}^3$), Ferry Street/Intercolonial/Kings Road/Argyle Street areas (7 – $16 \mu\text{g}/\text{m}^3$), Domtar Cell North location (15 and $20 \mu\text{g}/\text{m}^3$), Domtar Slag Ramp location ($13 \mu\text{g}/\text{m}^3$), and gas station along Victoria road ($113 \mu\text{g}/\text{m}^3$). Previously in March, a toluene value of $3.8 \mu\text{g}/\text{m}^3$ (GC result) was reported at French Street.



TABLE 12 June 2001 Portable GC Sampling Program Results

Sample ID #	Location	Sample Date and Time	Benzene ⁽¹⁾ ($\mu\text{g}/\text{m}^3$)	Toluene ⁽⁴⁾ ($\mu\text{g}/\text{m}^3$)	Instrument ($\mu\text{g}/\text{m}^3$)	Sample ID #	Location	Sample Date and Time	Benzene ⁽¹⁾ ($\mu\text{g}/\text{m}^3$)	Toluene ⁽⁴⁾ ($\mu\text{g}/\text{m}^3$)	Instrument ($\mu\text{g}/\text{m}^3$)
1	Cooling Tower Grids	June 6 10:30am	ND ⁽¹⁾	ND	Voyager	24	Coal Pile	June 7 12:55pm	ND	ND	Voyager
2	Coal Pile	June 6 10:40am	ND	ND	Voyager	25	Cooling Tower Grids	June 7 1:10pm	ND	ND	Voyager
3	Benzol Plant area	June 6 10:50am	16	ND	Voyager	26	Benzol Plant Area	June 7 1:16pm	ND	ND	Voyager
4	Domtar Cell North	June 6 11:15am	ND	ND	Voyager	27	Vulcan Avenue	June 7 1:28pm	ND	ND	Voyager
5	Domtar Slag Ramp	June 6 11:25am	ND	ND	Voyager	28	Domtar Cell North	June 8 10:27am	ND	trace ⁽⁴⁾	Scentex
6	Domtar road	June 6 11:40am	ND	ND	Voyager	30	Victoria Road Pharmacy	June 8 10:56am	ND	trace ⁽⁴⁾	Scentex
7	Upwind of Coke Ovens (JDAC)	June 6 11:45am	ND	ND	Voyager	31	Ligan / Maloney	June 8 11:02am	ND	ND	Scentex
8	200 French Street	June 6 11:50am	trace ⁽²⁾	ND	Voyager	32	Hankard Street Autobody	June 8 11:04am	ND	48	Scentex
9	Vulcan Avenue	June 6 12:02pm	ND	ND	Voyager	34	Upper Frederick Street	June 8 11:12am	ND	trace ⁽⁴⁾	Scentex
10	Gas Station, Victoria Road	June 6 12:15pm	25	113	Scentex	35	Domtar Cell North	June 8 1:10pm	ND	20	Scentex
11	26 Thomas Street	June 7 10:53am	ND	ND	Scentex	36	Domtar Slag Ramp	June 8 1:15pm	Trace ⁽³⁾	trace ⁽⁴⁾	Scentex
12	Ferry Street Weir	June 7 11:04am	trace ⁽²⁾	trace ⁽⁴⁾	Scentex, Voyager	37	Irving Bulk Station	June 8 6:00pm	ND	trace ⁽⁴⁾	Scentex
13	Terminal / Prince	June 7 11:11am	ND	ND	Voyager	38	Esso Bulk Station	June 8 6:10pm	ND	ND	Scentex
14	Ligan / Jamieson	June 7 11:25am	ND	ND	Voyager	39	Playground	June 8 6:15pm	ND	ND	Scentex
15	200 French Street	June 7 11:33am	ND	26	Scentex	40	Ferry / Intercolonial	June 8 6:30pm	trace ⁽³⁾	12	Scentex
16	Brook Street Autobody	June 7 11:43am	ND	15	Scentex	41	Ferry Street Weir	June 8 6:45pm	ND	7	Scentex
17	Eastmount / Ligan	June 7 11:52am	ND	ND	Scentex	42	Victoria Road Overpass	June 11 12:55pm	trace ⁽³⁾	trace ⁽⁴⁾	Scentex
18	brook, wetland area on Ligan	June 7 11:59am	ND	47	Scentex	43	Domtar Cell North	June 8 7:15pm	ND	15	Scentex
19	Church / Ligan	June 7 12:10pm	ND	ND	Scentex	44	Domtar Slag Ramp	June 11 12:40pm	ND	13	Scentex
20	Gunn / Ligan	June 7 12:17pm	ND	ND	Scentex	45	200 French Street	June 8 7:30pm	ND	ND	Scentex
21	Upwind of Coke Ovens, JDAC	June 7 12:23pm	ND	ND	Voyager	46	Kings Road / Argyle Street	June 11 11:49am	trace ⁽³⁾	16	Scentex
22	Domtar Cell North	June 7 12:40pm	9	ND	Scentex, Voyager	47	Esso Bulk Station	June 11 12:11pm	ND	ND	Scentex
23	Domtar Slag Ramp	June 7 12:48pm	ND	ND	Voyager	48	200 French Street	June 11 12:57pm	trace ⁽³⁾	trace ⁽⁴⁾	Scentex

Notes:

1. ND = Not detected. Reporting limits were based upon the low calibration standard. The reporting limit of the Voyager PID unit is $<10 \mu\text{g}/\text{m}^3$ for benzene and $<4 \mu\text{g}/\text{m}^3$ for toluene. The reporting limit of the Scentex AID unit is $<14 \mu\text{g}/\text{m}^3$ for benzene and $<4 \mu\text{g}/\text{m}^3$ for toluene.
2. Trace is $<10 \mu\text{g}/\text{m}^3$ for benzene
3. Trace is $<14 \mu\text{g}/\text{m}^3$ for benzene
4. Trace is $<4 \mu\text{g}/\text{m}^3$ for toluene

Table 13 contains results for the evacuated canisters sampling program north of the Domtar Tank, Terminal Road and 200 French Street on June 8th, 2001. A field duplicate sample from the north of the Domtar Tank area was submitted to Environment Canada in Ottawa for analysis. A field blank sample from the 200 French Street location was also submitted to



Environment Canada for analysis. A discussion on QA/QC comparisons is provided in Section 4.1.1. There were no exceedances to the available Ontario AAQC nor the Interim Separation Zone Criteria.

TABLE 13 June 2001 Results for Evacuated Canister Samples Collected During Portable GC Sampling Program

Parameter	MDL ⁽¹⁾		Coke Ovens North of Domtar Area		200 French St.		Terminal Road	Ontario Ambient Air Quality 24- hour Criteria ($\mu\text{g}/\text{m}^3$)	Interim Separation Zone Criteria ⁽⁴⁾ ($\mu\text{g}/\text{m}^3$)
	Environment Canada June 8 ($\mu\text{g}/\text{m}^3$)	PSC June 8 ($\mu\text{g}/\text{m}^3$)	Duplicate #1 PSC June 8 ($\mu\text{g}/\text{m}^3$)	Duplicate #2 Environment Canada June 8 ($\mu\text{g}/\text{m}^3$)	PSC June 8 ($\mu\text{g}/\text{m}^3$)	Field Blank Environment Canada June 8 ($\mu\text{g}/\text{m}^3$)	PSC June 8 ($\mu\text{g}/\text{m}^3$)		
Dichlorodifluoromethane	0.03	0.71	2.92	2.99	2.72	0.14	nd	500,000	na ⁽²⁾
Chloromethane	0.01	0.6	0.78	1.67	nd	0.12	nd	7,000	na
Halocarbon 114	0.05	1.19	nd ⁽²⁾	0.34	nd	0.13	nd	700,000	na
Vinyl Chloride	0.01	0.2	nd	0.06	nd	0.02	nd	1.0	na
Chloroethane	0.03	0.24	nd	0.13	nd	0.06	nd	na	na
1,2-Dichloroethane	0.02	0.61	nd	0.11	nd	0.04	nd	na	na
Bromomethane	0.04	0.35	nd	nd	nd	nd	nd	1,350	na
Trichlorofluoromethane	0.01	0.79	nd	1.68	1.12	0.05	1.46	6,000	na
1,1-Dichloroethene	0.03	0.75	nd	0.11	nd	0.07	nd	35	na
cis-1,2-Dichloroethene	0.02	0.56	nd	0.05	nd	0.03	nd	na	na
1,1-Dichloroethane	0.02	0.69	nd	0.08	nd	0.03	nd	200	na
1,2-Dichloropropane	0.02	0.69	nd	0.12	nd	0.03	nd	na	na
Dichloromethane	0.03	0.69	11.46	0.86	13.55	0.06	4.86	1765	na
Chloroform	0.02	0.73	nd	0.45	nd	0.03	nd	500	na
1,1,2,2-Tetrachloroethane	0.01	1.51	nd	0.11	nd	0.06	nd	na	na
1,1,1-Trichloroethane	0.04	0.76	nd	1.9	1.36	0.67	nd	115,000	na
1,1,2-Trichloroethane	0.03	0.65	nd	0.09	nd	0.05	nd	na	na
Toluene	0.02	0.49	5.65	1.44	4.9	0.15	2.75	2000	760
Benzene	0.04	0.54	0.86	0.49	nd	0.31	0.83	na	7
cis-1,3-Dichloropropene	0.01	0.64	nd	0.22	nd	nd	nd	na	na
trans-1,3-Dichloropropene	0.02	0.5	nd	0.18	nd	nd	nd	na	na
Trichloroethene	na ⁽³⁾	0.7	1.5	na	1.77	1.55	3.28	28000	na
Tetrachloroethene	0.02	1.02	nd	0.43	nd	0.07	nd	400	na
Carbon Tetrachloride	0.03	0.94	nd	0.66	nd	0.04	nd	600	na
Ethylbenzene	0.01	0.65	nd	0.27	nd	0.04	nd	4000 (1 hr)	200
m&p-Xylene	0.01	1	1.82	0.64	1.69	0.11	1.48	2300	36
o-Xylene	0.01	0.82	nd	0.23	nd	0.04	nd	na	na
1,3,5-Trimethylbenzene	0.01	1.28	nd	0.11	nd	0.03	nd	na	na
1,2,4-Trimethylbenzene	0.03	1.23	nd	0.3	nd	0.09	nd	1000	na
1,3-Dichlorobenzene	0.03	1.5	nd	0.09	nd	0.05	nd	na	na
1,4-Dichlorobenzene	0.02	1.74	nd	0.08	nd	0.03	nd	na	na
1,2-Dichlorobenzene	0.05	1.74	nd	0.1	nd	0.05	nd	39,500	na
Chlorobenzene	0.01	0.69	nd	nd	nd	0.04	nd	3,500	na
Styrene	0.01	8.52	nd	0.22	nd	0.02	nd	400	na

Notes:

- (1) MDL denotes method detection limit.
- (2) nd denotes not detected.
- (3) na denotes not available.
- (4) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.

Benzene was reported at a concentration of $0.86 \mu\text{g}/\text{m}^3$ north of the Domtar Tank and $0.83 \mu\text{g}/\text{m}^3$ at the Terminal Road location. Benzene was not detected at the 200 French Street location. Toluene was detected at a concentration of $5.65 \mu\text{g}/\text{m}^3$ north of the Domtar Tank, $2.75 \mu\text{g}/\text{m}^3$ at Terminal Road and $4.9 \mu\text{g}/\text{m}^3$ at 200 French Street. The benzene values on June 8th were lower than the March samples. The toluene value at the north of Domtar Tank area was higher on June 8th compared with the 24-hour sample result from March. The toluene value at 200 French Street was much higher in March than in June.

Other VOC compounds detected in the PSC samples were dichloromethane, trichloroethene, and xylene at the three sampling locations. The concentrations of these compounds were similar at both the north of Domtar Tank area and 200 French Street. A review of the duplicate and field blank results indicates that the dichloromethane and trichloroethene results can likely



be attributed to laboratory and canister artefacts, respectively. Trichlorofluoromethane was detected at both Terminal Road and 200 French Street at similar concentrations. These same compounds however, were reported in the March evacuated sample taken at 200 French Street at much higher concentrations. There were other VOC compounds detected in March, including trimethylbenzenes, styrene, ethyl benzene, tetrachloroethene, bromomethane and acetone, which were not detected at the north of Domtar Tank location. Although a suspect source cannot be found, the values were below the referenced guidelines (Table 11).

The Environment Canada duplicate sample from the North of Domtar Tank location reported many more VOC compounds, at levels below the analytical laboratory method detection limits. Many of the detected compounds had concentrations approaching values reported in the field blank sample, suggesting laboratory and canister artifacts.

In summary, benzene and toluene are present in the airshed along roadways and in or near autobody shops at similar concentrations as reported in the area of the Domtar Tank and Benzol Plant. The levels appear to increase in areas around gasoline service stations. Benzene and toluene were not detected in the Cooling Grid area, nor at bulk fuel plants. The levels appear to be overall slightly higher in June than in March; based on that, if the detection limit had been as high in March as in June, benzene and toluene would not have been detected at all except for the gas station location. Benzene in the evacuated canister samples at the north Coke Ovens fence line reported higher benzene results in March than June. Toluene however was higher in June at this location. Benzene and toluene were much higher in March at 200 French Street than in June. A review of the results indicates that there were no evident trends.

4.1.1 Portable GC Program QA/QC Results

Quality control/quality assurance measures included in the field GC program included multipoint calibrations using certified gas standards, analyses of method blanks and replicate analyses of field samples.

A set of duplicate canister samples at the site fenceline north of the Domtar Cell and a single sample on French Street were collected during the week after the March field GC sampling program (Table 11). Results for the duplicate samples differed for most analytes, but levels of all but acetone and bromomethane were less than 5 times the method detection limit, where precision criteria would be applicable for comparisons of analytes in the duplicates. The acetone is likely an artifact from the laboratory air.

The French Street sample was reported to contain numerous analytes not detected in the fenceline sample. These canisters had not been individually certified prior to their usage, and it is possible that residual volatiles from the canister's previous usage at sites with higher concentrations of volatiles were responsible for some of the detected compounds or that instrument carryover during the analysis resulted in false positives for this sample.

Table 14 provides a summary of duplicate sampling results from the June 2001 program for the Tedlar bag and evacuated canister analysis for benzene and toluene, which were the only target analytes for the GC/PID analyses. The sampling duration for both techniques was set to a similar time frame. The Tedlar bag sample was obtained over a 6-minute period and the



evacuated canister sample was obtained over 7 minutes. Samples were obtained at the corner of Charlotte and Townsend Streets.

TABLE 14 Comparison of Results from Portable GC/PID Analysis and Evacuated Canister Method TO-14 Analysis

Parameter	Evacuated Canister (µg/m³)	GC-PID (µg/m³)
Benzene	15.7	trace ⁽¹⁾
Toluene	4.9	<4

Notes:

- Trace indicates analyte detected at less than the reporting limit of 14 µg/m³.
The reporting limit for Toluene for the Scentex unit is 4 µg/m³ and for Benzene is 14 µg/m³.

Evacuated canister results for benzene and toluene were 15.7 and 4.9 µg/m³, respectively. Portable GC results were trace (present but less than <14 µg/m³) for benzene and non-detect for toluene, with a reporting limit of 4 µg/m³. The differences in results may be attributed to slight differences in sample time, sampling technique, and analytical equipment set-up as well as the differing sensitivities of the instruments.

Table 13 compares the results for the canister samples collected as field duplicates during the field GC program in June and submitted to Environment Canada and PSC for analyses by Method TO-14. There is a significant difference between the results for dichloromethane that is likely attributable to background levels of this common solvent in the PSC facility air. Trichlorofluoromethane and 1,1,1-trichloroethane were detected at Environment Canada at concentrations above PSC's detection limit but not detected by PSC.

4.2 TECHNOLOGY DEMONSTRATION PROGRAM RESULTS

Tables 15 and 16 provide the PAH results for the background sampling events prior to the collection of bulk sediment samples and sampling performed during the collection of bulk sediment samples, respectively. Naphthalene and benzo(a)pyrene are the only parameters for which there are referenced guidelines. Before the collection of bulk sediment samples, naphthalene results range from not detected at the DesBarres Street site (July 27th) to 1.03 ng/m³ at the Old Hospital site (July 31st). During the activities associated with the collection of bulk sediment samples, naphthalene results range from 0.17 ng/m³ at the Old Hospital Site (September 21st) to 2.07 ng/m³ at the Intercolonial Street site (September 20th). Before the collection of bulk sediment sample activities, benzo(a)pyrene was not detected at any of the sites, except for a value of 0.05 ng/m³ reported for DesBarres Street. During the collection of bulk sediment samples, benzo(a)pyrene was not detected on at least two occasions at each sampling site, with reported values of 0.05 - 0.34 ng/m³ when detected. All results are below the Ontario MOE and Separation Zone 24-hour naphthalene criteria of 22,500 ng/m³ and 3,000 ng/m³ respectively, as well as the MOE and Separation Zone benzo(a)pyrene criteria of 1.1 ng/m³, and 22,400 ng/m³, respectively.

A review of the results indicates that PAH compounds were present in the airshed at all sampling locations prior to and during the collection of bulk sediment samples. A comparison of the results for the background and bulk sediment sample collection time periods indicate that the concentrations of the various PAH compounds reported during the collection of bulk sediment samples appear slightly higher when compared to the pre-sediment collection analytical data.

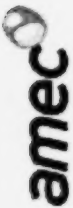


TABLE 15 PAH Results Prior to Bulk Sediment Sample Collection Activities

Parameter	DesBarres Street (ng/m³)	Intercolonial Street (ng/m³)	SYSCO Site Next to Former Hospital (ng/m³)	Field Blank (µg/PUF) ⁽¹⁾	Intercolonial Street Duplicate #1 (ng/m³)	Intercolonial Street Duplicate #2 (ng/m³)	DesBarres Street (ng/m³)	Intercolonial Street (ng/m³)	SYSCO Site Next to Former Hospital (ng/m³)	Ontario Ambient Air Quality 24-Hr Criteria (ng/m³)	Interim Separation Zone Criteria ⁽²⁾ (ng/m³)
Date	Jul 27	Jul 27	Jul 27	Jul 31	Aug 2	Aug 2	Aug 15	Aug 15	Aug 15	Aug 15	Aug 15
Naphthalene	<0.04	0.14	0.17	0.32	0.44	0.37	0.16	0.67	0.46	22500	3000
Acenaphthylene	<0.03	0.07	0.14	0.11	0.05	0.05	0.05	0.10	0.12	na ⁽³⁾	na
Acenaphthene	0.13	0.12	0.46	0.77	0.19	0.17	0.10	0.95	0.35	na	na
Fluorene	0.56	0.55	1.91	1.96	0.85	0.81	0.55	2.17	1.44	na	na
Phenanthrene	4.25	3.35	9.54	10.40	7.94	7.62	4.97	11.72	12.10	na	na
Anthracene	0.37	3.35	1.24	0.92	0.71	0.71	0.37	1.25	0.89	na	na
Fluoranthene	1.62	0.86	3.18	2.40	3.29	3.20	1.52	3.74	3.46	na	na
Pyrene	1.43	0.50	1.50	1.83	2.03	1.72	1.33	1.80	1.30	na	na
Benzo(a)anthracene	0.08	<0.02	<0.03	<0.02	<0.03	<0.02	<0.03	<0.02	<0.03	na	na
Chrysene	0.16	0.05	0.09	0.08	0.11	0.10	0.05	0.07	0.06	na	na
Benzo Fluoranthene	0.21	0.05	<0.03	0.16	0.11	0.10	<0.03	0.07	<0.03	na	na
Benzo(a)pyrene	0.05	<0.02	<0.03	<0.02	<0.03	<0.02	<0.03	<0.02	<0.03	1.1	22,400
Indeno(1,2,3-cd)pyrene	<0.05	<0.05	<0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.06	na	na
Dibenz(a,h)anthracene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	na	na
Benzo(g,h,i)perylene	0.11	<0.04	<0.04	<0.02	<0.04	<0.04	<0.04	<0.04	<0.04	na	na

Notes: (1) denotes values that are raw lab values and are expressed in µg/PUF.

(2) na denotes not available

(3) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.

TABLE 16 PAH Results During Bulk Sediment Sample Collection Activities

Parameter	DesBarres Street (ng/m³)	Intercolonial Street (ng/m³)	SYSCO Site Next to Former Hospital (ng/m³)	DesBarres Street (ng/m³)	Intercolonial Street (ng/m³)	SYSCO Site Next to Former Hospital (ng/m³)	Ontario Ambient Air Quality 24-Hr Criteria (ng/m³)	Interim Separation Zone Criteria ⁽²⁾ (ng/m³)
Date	Sept 18	Sept 18	Sept 18	Sept 19	Sept 19	Sept 19	Sept 21	Sept 21
Naphthalene	1.21	0.69	0.96	1.27	2.07	1.87	0.48	0.17
Acenaphthylene	2.64	0.10	0.09	0.20	0.21	0.25	0.10	0.03
Acenaphthene	0.79	0.97	0.58	0.38	0.83	0.66	0.19	0.14
Fluorene	3.17	2.22	2.10	1.52	2.69	2.54	0.94	0.97
Phenanthrene	13.99	11.99	13.40	9.36	14.67	7.72	9.84	10.84
Anthracene	2.19	1.28	1.02	1.92	1.74	0.66	0.74	0.77
Fluoranthene	4.22	3.83	2.04	3.54	4.89	1.87	2.30	2.42
Pyrene	3.43	1.84	0.96	2.07	2.27	1.16	1.46	1.68
Benzo(a)anthracene	0.45	<0.03	0.06	0.23	0.07	0.14	0.10	0.37
Chrysene	0.50	0.08	0.12	0.38	0.12	0.30	0.19	0.51
Benzo Fluoranthene	0.71	0.08	0.15	0.35	0.12	0.33	0.24	0.60
Benzo(a)pyrene	0.34	<0.03	<0.03	0.10	0.05	0.11	0.10	0.26
Indeno(1,2,3-cd)pyrene	0.29	<0.05	<0.06	<0.05	<0.06	0.14	0.05	0.20
Dibenz(a,h)anthracene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(g,h,i)perylene	0.29	<0.04	<0.04	0.10	0.13	0.17	0.17	0.23

Notes: (1) na denotes not available

(2) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.



Prior to bulk sediment collection activities, the PAH compounds appear to be the same at the DesBarres Street and Intercolonial Street locations on July 27th and slightly higher at the SYSCO site, which was downwind that day (wind prevailing NNW). On July 31st, the results appear similar at all three locations (wind prevailing NNE). On August 15th, the DesBarres Street sample appears slightly lower than the other two locations (wind prevailing south). Even when the prevailing wind was different each sampling day, a review of the results for Intercolonial Street indicates there is little variation in concentrations for the four sampling events.

During bulk sediment collection activities, the PAH compounds appear to be similar at Intercolonial Street and SYSCO on September 18th and slightly higher at DesBarres Street (winds prevailing from the SSE). On September 19th (winds prevailing from the NNW) the results appear higher at Intercolonial Street followed by DesBarres Street and lowest at the SYSCO site. On September 20th (winds prevailing from the SSE), the trend is similar to the September 19th data, and the winds were prevailing from the SSE, suggesting that the Tar Ponds could have contributed PAHs to the airshed because Intercolonial Street was downwind. On September 21st, the PAH concentrations appear similar at the Intercolonial Street and SYSCO site (winds prevailing from the SSE).

Tables 17 and 18 provide the VOC results for the background sampling events and sampling performed during bulk sediment collection activities, respectively. All results are below the Ontario MOE and Separation Zone 24-hour criteria for VOC parameters for which criteria are available.

A comparison of VOC background results with results obtained during the bulk sediment collection activities indicates that the results are generally similar for all parameters. The parameters most commonly detected include dichlorodifluoromethane, chloromethane, trichloromethane, dichloromethane, trichloroethene, benzene, toluene and xylenes. On August 2nd, trimethylbenzene and dichlorobenzenes were detected in one of two duplicates, and not in any other samples. Therefore these compounds are considered artifacts. On any one day, the concentrations appear to be similar at all three sampling locations.

Benzene concentrations ranged from non-detected to 1.66 µg/m³ during background sampling events and from 0.70 to 2.33 µg/m³ (when detected) on September 18th and 20th. Toluene concentrations ranged from non-detect to 4.14 µg/m³ during background sampling events and 1.43 to 2.79 during bulk sediment collection activities (when detected).

In summary, there is no apparent evidence that the bulk sediment collection activities have contributed VOCs to the airshed. The upwind VOC data compared with downwind data indicates no apparent differences. Comparing upwind PAH data with downwind PAH data indicates that on two occasions (July 27th and September 20th), the Tar Ponds appear to have contributed PAHs to the airshed, however, the reported values are still well below the referenced guidelines.

A truck spilled diesel fuel approximately 200 metres from the SYSCO sampling location on September 20th while a sample was being taken at the SYSCO sampling station. After the spill was cleaned up a second canister was used to collect a sample from 11:30 am on September 20th to 11:30 am on September 21st. The results of the two samples from this location are similar, indicating that it is not evident that the spill adversely influenced the initial sample.

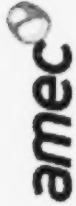


TABLE 17 Evacuated Canister Results Prior to Bulk Sediment Sample Collection Activities

Parameter	MDL ⁽¹⁾ (µg/m ³)	DesBarres Street (µg/m ³)	Intercolonial Street (µg/m ³)	SYSO Site Next to Former Hospital (µg/m ³)	SYSO Site Next to Former Hospital (µg/m ³)	DesBarres Street (µg/m ³)	Field Blank Intercolonial Street (µg/m ³)	Duplicate #1 Intercolonial Street (µg/m ³)	Duplicate #2 Intercolonial Street (µg/m ³)	DesBarres Street (µg/m ³)	SYSO Site Next to Former Hospital (µg/m ³)	Intercolonial Street (µg/m ³)	Ontario Ambient Air Quality 24-Hr Criteria ⁽⁴⁾ (µg/m ³)	Interim Separation Zone Criteria ⁽⁴⁾ (µg/m ³)
Date		Jul 31	Jul 31	Jul 31	Jul 31	Aug 2	Aug 2	Aug 2	Aug 2	Aug 8	Aug 8	Aug 8		
Dichlorodifluoromethane	0.71	1.59	1.98	3.01	3.01	0.85	nd	1.06	1.49	2.05	2.40	1.31	500,000	na ⁽²⁾
Chloromethane	0.60	1.32	1.20	2.68	2.68	nd	nd	1.65	1.01	nd	0.60	nd	7,000	na
Trichlorofluoromethane	0.79	1.69	2.42	1.57	1.74	1.18	nd	1.97	2.02	1.63	1.74	1.57	6,000	na
Dichloromethane	0.69	1.81	1.74	3.37	3.37	nd	nd	2.99	nd	23.28	10.07	3.40	1,765	na
Chloroform	0.73	nd	nd	nd	nd	nd	nd	nd	nd	nd	2.00	nd	500	na
Halocarbon 113	1.07	nd	1.30	nd	nd	nd	nd	nd	1.46	nd	nd	nd	80,000	na
1,1,1-Trichloroethane	0.76	nd	nd	nd	nd	1.74	nd	nd	1.50	nd	1.25	nd	115,000	na
Toluene	0.49	3.01	4.14	2.11	2.15	1.73	nd	1.88	1.50	2.64	nd	nd	2,000	760
Benzene	0.54	0.80	0.91	nd	nd	1.09	nd	0.86	0.73	1.66	0.73	0.73	na ⁽³⁾	7
Trichloroethene	0.70	nd	nd	nd	nd	2.58	nd	nd	nd	1.13	nd	nd	28,000	na
Tetrachloroethene	1.02	nd	nd	nd	nd	nd	nd	nd	nd	3.73	nd	nd	na	200
Ethyl Benzene	0.65	nd	nd	nd	nd	nd	nd	0.78	nd	nd	nd	nd	4,000	na
m,p-Xylene	1.00	1.08	1.22	nd	nd	1.04	nd	2.39	1.48	1.35	1.042	nd	2,300	36
o-Xylene	0.82	nd	nd	nd	nd	nd	nd	1.22	nd	nd	nd	nd	na	na
1,3,5-Trimethylbenzene	1.28	nd	nd	nd	nd	nd	nd	2.51	nd	nd	nd	nd	na	na
1,2,4-Trimethylbenzene	1.23	nd	nd	nd	nd	nd	nd	3.93	nd	nd	nd	nd	1,000	na
1,3-Dichlorobenzene	1.50	nd	nd	nd	nd	nd	nd	4.21	nd	nd	nd	nd	na	na
1,4-Dichlorobenzene	1.74	nd	nd	nd	nd	nd	nd	4.87	nd	nd	nd	nd	na	na
1,2-Dichlorobenzene	1.74	nd	nd	nd	nd	nd	nd	4.69	nd	nd	nd	nd	na	na
1,2,4-Trichlorobenzene	1.19	nd	nd	nd	nd	nd	nd	24.49	nd	nd	nd	nd	400	na
Hexachloro 1,3-butadiene	3.52	nd	nd	nd	nd	nd	nd	23.46	nd	nd	nd	nd	na	na

Notes:
(1) MDL denotes minimum detection limit
(2) nd denotes not detected
(3) na denotes not available
(4) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.

TABLE 18 Evacuated Canister Results During Bulk Sediment Sample Collection Activities

Parameter	MDL ⁽¹⁾ (µg/m ³)	SYSO Site Next to Former Hospital (µg/m ³)	Intercolonial Street (µg/m ³)	DesBarres Street (µg/m ³)	SYSO Site Next to Former Hospital (µg/m ³)	SYSO Site Next to Former Hospital (µg/m ³)	Ontario Ambient Air Quality 24-Hr Criteria ⁽⁴⁾ (µg/m ³)	Interim Separation Zone Criteria ⁽⁴⁾ (µg/m ³)
Date		Sept 18	Sept 18	Sept 18	Sept 18	Sept 20 11:30 am to 21 st 11:30 am 21 st		
Dichlorodifluoromethane	0.71	0.74	nd ⁽²⁾	1.80	1.84	2.12	500,000	na ⁽²⁾
Trichlorofluoromethane	0.79	1.24	1.12	1.40	1.52	1.91	6,000	na
Toluene	0.49	1.43	2.19	2.68	2.30	2.75	2,000	760
Benzene	0.54	nd	0.70	2.33	1.18	0.86	na ⁽³⁾	7
Trichloroethene	0.70	nd	0.86	2.36	nd	0.81	28,000	na
m,p-Xylene	1.00	nd	1.17	1.30	1.26	1.39	2,300	36
1,2,4-Trimethylbenzene	1.23	nd	nd	nd	nd	1.28	1,000	na

Notes:
(1) MDL denotes minimum detection limit
(2) nd denotes not detected
(3) na denotes not available
(4) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.

4.2.1 Technology Demonstration Program QA/QC Results

Quality control measures included the use of individually certified canisters, the analysis of field blanks and the analyses of duplicate samples collected at the Intercolonial Street site during the background monitoring. The field blank for volatile organics, a certified canister that accompanied the program, was free of volatile organics. The field blank for PAH was a PUF/filter set which was exposed in the field for a time period comparable to that required for the installation and removal of the PUF and filter for an actual sample. A trace level of naphthalene was detected in the field blank.

Precision for field duplicates is typically expressed as relative percent difference (RPD), which is calculated in accordance with the following formula:

$$RPD = 100 \times (\text{Difference between the two measurements}) / (\text{Average of the two measurements})$$

Criteria for precision are not applicable when results fall close to the method detection limits, since minor variances in measurements near the instrument sensitivity limits may create high relative differences between measurements that are close in absolute values.

Method TO-14A for volatile organics indicates that single-laboratory precision within 20% RPD can be achieved for analyses of whole air samples collected in SUMMA canisters. The results of the collocated samples (Table 17) agree within method expectations for benzene, toluene and xylenes and for common halocarbons (dichlorodifluoromethane, chloromethane and trichlorofluoromethane). Volatile organics reported in the duplicate samples collected at the Intercolonial Street site are at low concentrations, with most less than a factor of five times the respective method detection limits. Analytes detected in both samples agree within less than 1 $\mu\text{g}/\text{m}^3$. However, the analysis of Duplicate 1 sample in this set of results in the detection of several compounds is not detected in Duplicate 2. The pattern of chemicals reported in Duplicate 1 is highly suggestive of instrument contamination at the time of analysis with residual material from the standards analysis. The laboratory, upon further review of the data, has confirmed the probability that this analysis was compromised.

Results for the field duplicate samples collected at Intercolonial Street for PAH on August 2, 2001 demonstrate high precision, with RPD values ranging from 0% to 17% (Table 15).

4.3 LANDFILL CLOSURE PROJECT RESULTS

Table 19 provides a summary of TSP sampling performed both prior to (background) and during Landfill Closure activities.

TSP results range from 16.22 $\mu\text{g}/\text{m}^3$ to 43.70 $\mu\text{g}/\text{m}^3$ during background sampling, and 9.61 $\mu\text{g}/\text{m}^3$ to 68.48 $\mu\text{g}/\text{m}^3$ during landfill closure activities. All results are below the Nova Scotia Ambient Air Objective for TSP of 120 $\mu\text{g}/\text{m}^3$ for a 24-hour averaging period. Prior to landfill closure activities, the TSP values were similar at all three locations on any given sampling day. During landfill closure activities, the variances in reported TSP values were greater than before. The only day, however, where a sample location downwind of the landfill reported a higher value than upwind locations was on September 20th when a TSP value of 68.48 $\mu\text{g}/\text{m}^3$ was reported.

TABLE 19 Landfill Closure Project TSP Results

Date	581 Grand Lake Road ($\mu\text{g}/\text{m}^3$)	Frederick Street ($\mu\text{g}/\text{m}^3$)	Vulcan Avenue ($\mu\text{g}/\text{m}^3$)	275 Welton Street ($\mu\text{g}/\text{m}^3$)	Prevailing Wind (blowing from)	Nova Scotia Air Quality Objectives 24-hour Criteria ($\mu\text{g}/\text{m}^3$)
Background						
August 21 st	17.58	19.23	29.39	NA ⁽¹⁾	SE	120
August 22 nd	24.41	16.22	17.96	NA	SSW	120
August 23 rd	33.22	43.70	33.83	NA	SSW	120
Active						
Sept 14	19.97	33.63	NA	29.20	NNW	120
Sept 20	47.71	68.48	NA	38.46	SSE	120
Sept 26	21.32	9.61	NA	13.28	ESE	120
Oct 2	24.03	31.21	NA	18.10	SSW	120
Oct 10	20.92	27.36	NA	17.33	SW	120
Oct 16	18.78	18.12	NA	19.55	SW	120
Oct 22	19.69	20.76	NA	16.52	W	120

Note:

(1) NA denotes not applicable.

4.4 SUMMARY OF FIXED STATION AMBIENT AIR MONITORING PROGRAM RESULTS

This section provides a summary of PAH, $\text{PM}_{2.5}$, PM_{10} , metals, and VOC results for the 2001 Fixed Station AAMP. Each parameter is summarized by providing average mean, minimum and maximum values, standard deviation, number of samples and percent of results for the November and December monitoring period. Values below the analytical detection limit are inputted in the datasets at half the detection limit. The standard deviation was calculated as a measure of the variability in reported results. Averages and standard deviations were not calculated for sample sets where all values were reported below the method detection limit. In addition, typical average mean levels in other suburban and urban airsheds (Hamilton, Ontario; and St. John's, Newfoundland) are provided over a similar November and December time period. Hamilton is a steel producing city with coking operations. St. John's has a marine climate. A summary of 24-hour AAQC and CWS, if available, is used to compare against the data. The number of exceedances to the 24-hour AAQC or CWS over the annual monitoring period is also provided for each parameter.

Environment Canada provided the data for Hamilton and St. John's for the Year 2000 – 2001. It is understood that the data has been validated.

In addition, November and December 2000 PM_{10} , metals, PAH and VOC results are included for comparison to the 2001 results for the Victoria Road and Frederick Street locations.

4.4.1 PAH Results

Tables 20 to 25 provide a summary of PAH results for the six Fixed Station AAMP program locations. The Ontario MOE provides 24-hour AAQC for the naphthalene and benzo(a)pyrene parameters. There are no exceedances during the monitoring performed in November and December for naphthalene and benzo(a)pyrene parameters. There are also no exceedances for the Separation Zone criteria for naphthalene and benzo(a)pyrene established for the Coke Ovens site.

Average total PAH results for November and December indicate that the program location (Kings Road) that is remote from the Tar Ponds and Coke Ovens site had the lowest average PAH value of 8.64 ng/m³. Victoria Road and Frederick Street had average PAH values of 9.93 and 14.39 ng/m³ respectively. Henry Street had an average PAH value of 17.74 ng/m³. DesBarres Street and Intercolonial Street had average PAH values of 19.01 and 13.38 ng/m³ respectively.

A comparison of 2001 November and December results with 2000 results indicate that the 2001 total PAH results are approximately 40% lower than the 2000 results for the Victoria Road location. PAH results for the Frederick Street location were similar for each of the 2000 and 2001 time periods.

Tables 20 to 25 also contain average PAH levels for the cities of Hamilton, Ontario (November and December 2001) and St. John's, Newfoundland (November and December 2000). The data was obtained from the Environment Canada database and was compiled by AMEC. It should be noted that the Environment Canada database did not contain three PAH parameters (naphthalene, benzo(a)anthracene, and benzo fluoranthene) that were sampled and analysed as part of air monitoring performed for the Muggah Creek Remediation Project.

The average total PAH for Hamilton was 28.13 ng/m³ for the November and December 2001 time period. The average total PAH for the November and December 2000 time period for St. John's was 5.18 ng/m³. The average total PAH concentrations for the Muggah Creek Remediation Project AAMP ranged from a low of 8.6 ng/m³ at the Kings Road location to a high of 19.0 ng/m³ at the DesBarres Street location for November and December 2001. Total PAH results for the Sydney monitoring locations were all lower than the Hamilton average results for the same time period. With the naphthalene, benzo(a)anthracene and benzo flouranthene results removed from the Sydney total PAH average values, Hamilton total PAH results ranged from being 70% higher than the DesBarres Street location average total PAH value to four times higher than the Kings Road location average value. St. John's total PAH results were consistently lower in November and December 2000 when compared to total PAH results for November and December 2001 for the Sydney locations. St. John's total PAH results ranged from being 30% lower than the total PAH Kings Road location average value to three times lower than the DesBarres Street location total PAH average value. The naphthalene, benzo(a)anthracene and benzo flouranthene results were also not included in the Sydney dataset for this comparison.

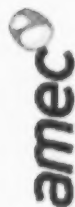


TABLE 20 Fixed Station Ambient Air Monitoring Program November and December PAH Results Location 1: Victoria Road

Parameter	Nov/Dec 2001 Average (ng/m ³)	Minimum Value (ng/m ³)	Maximum Value (ng/m ³)	Standard Deviation	Number of Samples	% Detected	Nov/ Dec Average 2000 (ng/m ³)	Typical		Regulatory Guideline ^(b)	Number of Exceedances	Separation Zone Short Term Criteria ^(a) (ng/m ³)
								Nov/Dec Average Levels in Hamilton ⁽¹⁾ (ng/m ³)	St. John's ⁽¹⁾ (ng/m ³)			
								24-hour (ng/m ³)				
Naphthalene	1.12	0.21	2.42	0.77	6	100.0	1.25	na ^(a)	na	22500	0	3000
Acenaphthylene	0.63	<0.07	2.33	0.85	6	83.3	1.22	3.22	0.86	na	na	na
Acenaphthene	0.16	<0.07	0.46	0.15	6	50.0	0.34	1.36	0.16	na	na	na
Fluorene	1.14	0.56	2.50	0.73	6	100.0	1.89	4.92	0.66	na	na	na
Phenanthrene	3.3	1.6	6.0	1.6	6	100.0	5.51	9.33	2.10	na	na	na
Anthracene	0.74	0.21	1.50	0.60	6	100.0	0.81	1.41	0.20	na	na	na
Fluoranthene	0.89	0.45	1.49	0.46	6	100.0	1.30	3.20	0.61	na	na	na
Pyrene	0.88	0.42	1.57	0.48	6	100.0	1.12	2.67	0.40	na	na	na
Benzo(a)anthracene	0.13	<0.06	0.24	0.07	6	50.0	0.27	na	na	na	na	na
Chrysene	0.22	<0.07	0.46	0.15	6	66.7	0.38	0.66	0.08	na	na	na
Benzo Fluoranthene	0.28	<0.01	0.71	0.28	6	50.0	0.59	na	na	na	na	na
Benzo(a)pyrene	0.12	<0.06	0.22	0.06	6	50.0	0.17	0.27	0.01	1.1	0	22,400
Indeno(1,2,3-cd)pyrene	0.13	<0.06	0.27	0.08	6	50.0	0.24	0.49	0.05	na	na	na
Dibenzo(a,h)anthracene	-- ⁽⁴⁾	<0.06	<0.07	--	6	0.0	0.08	0.07 ⁽⁶⁾	0.01 ⁽⁶⁾	na	na	na
Benzo(g,h,i)perylene	0.17	<0.07	0.33	0.10	6	66.7	0.26	0.53	0.04	na	na	na
Total PAH	9.9	--	--	--	--	--	15.43	28.13	5.18	na	na	na

Notes:

- (1) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2001) and St. John's (2000).
- (2) Guidelines obtained from Ontario Ministry of Environment, Ambient Air Quality Criteria for a 24-hour averaging period.
- (3) na denotes not available.
- (4) -- denotes not applicable.
- (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (6) Values are for Dibenzo(a,c)anthracene and Dibenzo(a,h)anthracene.

TABLE 21 Fixed Station Ambient Air Monitoring Program November and December PAH Results Location 2: Frederick Street

Parameter	Nov/Dec 2001 Average (ng/m ³)	Minimum Value (ng/m ³)	Maximum Value (ng/m ³)	Standard Deviation	Number of Samples	% Detected	Nov/Dec Average 2000 (ng/m ³)	Typical Nov/Dec Average Levels in Hamilton ⁽¹⁾ (ng/m ³)	Typical Nov/Dec Average Levels in St. John's ⁽¹⁾ (ng/m ³)	Regulatory Guideline ⁽²⁾	Number of Exceedances	Separation Zone Short Term Criteria ⁽⁵⁾ (ng/m ³)
Naphthalene	0.55	0.21	0.75	0.21	6	100.0	1.21	na ⁽³⁾	na	22500	0	3000
Acenaphthylene	0.73	0.23	1.23	0.43	6	100.0	0.58	3.22	0.86	na	na	na
Acenaphthene	0.23	0.13	0.54	0.16	6	100.0	0.42	1.36	0.16	na	na	na
Fluorene	1.49	0.72	2.81	0.86	6	100.0	1.63	4.92	0.66	na	na	na
Phenanthrene	5.2	2.5	11.0	3.2	6	100.0	5.32	9.33	2.10	na	na	na
Anthracene	1.26	0.38	3.83	1.30	6	100.0	0.81	1.41	0.20	na	na	na
Fluoranthene	1.46	0.95	2.83	0.73	6	100.0	1.39	3.20	0.61	na	na	na
Pyrene	1.55	0.87	3.83	1.14	6	100.0	1.01	2.67	0.40	na	na	na
Benzo(a)anthracene	0.24	<0.06	0.54	0.16	6	83.3	0.24	na	na	na	na	na
Chrysene	0.44	0.25	1.00	0.28	6	100.0	0.40	0.66	0.08	na	na	na
Benzo Fluoranthene	0.62	0.33	1.40	0.40	6	100.0	0.53	na	na	na	na	na
Benzo(a)pyrene	0.17	<0.06	0.43	0.14	6	66.7	0.11	0.27	0.01	1.1	0	22,400
Indeno(1,2,3-cd)pyrene	0.20	<0.06	0.38	0.11	6	83.3	0.21	0.49	0.05	na	na	na
Dibenzo(a,h)anthracene	-- ⁽⁴⁾	<0.06	<0.06	--	6	0	0.08	0.07 ⁽⁶⁾	0.01 ⁽⁶⁾	na	na	na
Benzo(g,h,i)perylene	0.22	<0.06	0.51	0.15	6	83.3	0.18	0.53	0.04	na	na	na
Total PAH	14.4	--	--	--	--	--	14.10	28.13	5.18	na	na	na

Notes:

- (1) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2001) and St. John's (2000).
- (2) Guidelines obtained from Ontario Ministry of Environment, Ambient Air Quality Criteria for a 24-hour averaging period.
- (3) na denotes not available.
- (4) -- denotes not applicable.
- (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (6) Values are for Dibenzo(a,c)anthracene and Dibenzo(a,h)anthracene.

TABLE 22 Fixed Station Ambient Air Monitoring Program November and December PAH Results Location 3: Henry Street

Parameter	Nov/Dec 2001 Average (ng/m ³)	Minimum Value (ng/m ³)	Maximum Value (ng/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽¹⁾ (ng/m ³)	Typical Nov/Dec Average Levels in St. John's ⁽¹⁾ (ng/m ³)	Regulatory Guideline ⁽²⁾	Number of Exceedances	Separation Zone Short Term Criteria ⁽⁵⁾ (ng/m ³)
Naphthalene	1.83	0.73	4.39	1.30	6	100.0	na ⁽³⁾	na	22500	0	3000
Acenaphthylene	1.28	0.45	2.39	0.87	6	100.0	3.22	0.86	na	na	na
Acenaphthene	0.31	<0.07	0.63	0.20	6	83.3	1.36	0.16	na	na	na
Fluorene	1.62	0.97	2.64	0.59	6	100.0	4.92	0.66	na	na	na
Phenanthrene	5.2	2.6	6.6	1.6	6	100.0	9.33	2.10	na	na	na
Anthracene	1.34	0.79	1.76	0.40	6	100.0	1.41	0.20	na	na	na
Fluoranthene	1.79	0.88	2.67	0.68	6	100.0	3.20	0.61	na	na	na
Pyrene	1.71	0.85	2.76	0.67	6	100.0	2.67	0.40	na	na	na
Benzo(a)anthracene	0.34	0.17	0.60	0.15	6	100.0	na	na	na	na	na
Chrysene	0.56	0.31	0.89	0.20	6	100.0	0.66	0.08	na	na	na
Benzo Fluoranthene	0.70	0.40	1.21	0.28	6	100.0	na	na	na	na	na
Benzo(a)pyrene	0.20	<0.07	0.29	0.10	6	66.7	0.27	0.01	1.1	0	22,400
Indeno(1,2,3-cd)pyrene	0.25	<0.07	0.49	0.14	6	83.3	0.49	0.05	na	na	na
Dibenzo(a,h)anthracene	-- ⁽⁴⁾	<0.06	<0.07	--	6	0.00	0.07 ⁽⁶⁾	0.01 ⁽⁶⁾	na	na	na
Benzo(g,h,i)perylene	0.26	0.14	0.52	0.14	6	100.0	0.53	0.04	na	na	na
Total PAH	17.4	--	--	--	--	--	28.13	5.18	na	na	na

Notes:

- (1) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2001) and St. John's (2000).
- (2) Guidelines obtained from Ontario Ministry of Environment, Ambient Air Quality Criteria for a 24-hour averaging period.
- (3) na denotes not available.
- (4) -- denotes not applicable.
- (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (6) Values are for Dibenzo(a,c)anthracene and Dibenzo(a,h)anthracene.

TABLE 23 Fixed Station Ambient Air Monitoring Program November and December PAH Results Location 4: Kings Road

Parameter	Nov/Dec Average (ng/m ³)	Minimum Value (ng/m ³)	Maximum Value (ng/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽¹⁾ (ng/m ³)	Regulatory Guideline ⁽²⁾ (ng/m ³)	Number of Exceedances	Separation Zone Short Term Criteria ⁽⁵⁾ (ng/m ³)
Naphthalene	1.10	0.68	1.76	0.43	6	100.0	na ⁽³⁾	22500	0	3000
Acenaphthylene	0.66	<0.07	2.06	0.74	6	83.3	3.22	na	na	na
Acenaphthene	0.14	<0.07	0.33	0.10	6	50.0	1.36	na	na	na
Fluorene	1.05	0.70	2.11	0.54	6	100.0	4.92	na	na	na
Phenanthrene	2.7	1.74	5.1	1.2	6	100.0	9.33	na	na	na
Anthracene	0.55	0.24	0.99	0.33	6	100.0	1.41	na	na	na
Fluoranthene	0.72	0.39	1.26	0.29	6	100.0	3.20	na	na	na
Pyrene	0.71	0.41	1.36	0.34	6	100.0	2.67	na	na	na
Benzo(a)anthracene	0.09	<0.06	0.23	0.07	6	16.7	na	na	na	na
Chrysene	0.22	0.14	0.39	0.09	6	100.0	0.66	na	na	na
Benzo Fluoranthene	0.26	<0.12	0.64	0.21	6	33.3	na	na	na	na
Benzo(a)pyrene	0.11	<0.06	0.18	0.05	6	50.0	0.27	1.1	0	22,400
Indeno(1,2,3-cd)pyrene	0.10	<0.06	0.28	0.09	6	16.7	0.49	na	na	na
Dibenzo(a,h)anthracene	– ⁽⁴⁾	<0.06	<0.07	–	6	0.0	0.07 ⁽⁶⁾	na	na	na
Benzo(g,h,i)perylene	0.13	<0.06	0.31	0.10	6	50.0	0.53	na	na	na
Total PAH	8.6	–	–	–	–	–	28.13	na	na	na

Notes:

- (1) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2001) and St. John's (2000).
- (2) Guidelines obtained from Ontario Ministry of Environment, Ambient Air Quality Criteria for a 24-hour averaging period.
- (3) na denotes not available.
- (4) – denotes not applicable.
- (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (6) Values are for Dibenzo(a,c)anthracene and Dibenzo(a,h)anthracene.

TABLE 24 Fixed Station Ambient Air Monitoring Program November and December PAH Results Location 5: Intercolonial Street

Parameter	Nov/Dec Average (ng/m ³)	Minimum Value (ng/m ³)	Maximum Value (ng/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽¹⁾ (ng/m ³)	Regulatory Guideline ⁽²⁾ (ng/m ³)	Number of Exceedances	Separation Zone Short Term Criteria ⁽⁵⁾ (ng/m ³)
Naphthalene	1.49	0.83	2.46	0.72	6	100.0	na ⁽³⁾	22500	0	3000
Acenaphthylene	0.91	0.29	2.27	0.76	6	100.0	3.22	na	na	na
Acenaphthene	0.32	0.24	0.38	0.07	6	100.0	1.36	na	na	na
Fluorene	1.71	1.15	2.94	0.65	6	100.0	4.92	na	na	na
Phenanthrene	4.6	3.2	8.5	2.0	6	100.0	9.33	na	na	na
Anthracene	0.63	0.39	0.99	0.22	6	100.0	1.41	na	na	na
Fluoranthene	1.19	0.80	2.03	0.45	6	100.0	3.20	na	na	na
Pyrene	1.09	0.62	2.08	0.51	6	100.0	2.67	na	na	na
Benzo(a)anthracene	0.21	<0.07	0.43	0.12	6	83.3	na	na	na	na
Chrysene	0.29	<0.07	0.56	0.16	6	83.3	0.66	na	na	na
Benzo Fluoranthene	0.43	<0.13	0.85	0.24	6	83.3	na	na	na	na
Benzo(a)pyrene	0.14	<0.07	0.29	0.09	6	50.0	0.27	1.1	0	22,400
Indeno(1,2,3-cd)pyrene	0.13	<0.07	0.35	0.11	6	50.0	0.49	na	na	na
Dibenzo(a,h)anthracene	– ⁽⁴⁾	<0.07	<0.08	–	6	0.0	0.07 ⁽⁶⁾	na	na	na
Benzo(g,h,i)perylene	0.19	<0.07	0.43	0.13	6	83.3	0.53	na	na	na
Total PAH	13.4	–	–	–	–	–	28.13	na	na	na

Notes:

- (1) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2001) and St. John's (2000).
- (2) Guidelines obtained from Ontario Ministry of Environment, Ambient Air Quality Criteria for a 24-hour averaging period.
- (3) na denotes not available.
- (4) – denotes not applicable.
- (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (6) Values are for Dibenzo(a,c)anthracene and Dibenzo(a,h)anthracene.

using TSP high volume samplers at three or four of the program locations. As well, there are referenced guidelines available for metals analyzed for the TSP fraction.

Tables 26, 27, and 28 also contain average PM₁₀ levels for the cities of Hamilton, Ontario and Montreal, Quebec for the November and December 2000 time period. Tables 29, 30, and 31 contain average PM_{2.5} levels for Hamilton and Montreal for the November and December 2000 time period. The data was obtained from the Environment Canada database and was compiled by AMEC.

The average PM₁₀ values for Hamilton and Montreal were respectively 22.8 µg/m³ and 19.8 µg/m³ for the November and December 2000 time period. The average PM₁₀ concentrations for the Muggah Creek Remediation Project AAMP ranged from a low of 7.6 µg/m³ at the Victoria Road location to a high of 9.5 µg/m³ at the Frederick Street location for November and December 2001. November and December 2001 PM₁₀ results for the Sydney monitoring locations were, therefore, all lower than the Hamilton and Montreal average results for November and December 2000.

The average PM_{2.5} values for Hamilton and Montreal were respectively 15.2 µg/m³ and 12.4 µg/m³ for the same time period. The average PM_{2.5} concentrations for the Sydney monitoring locations ranged from a low of 12.1 µg/m³ at the Henry Street location to a high of 20.8 µg/m³ at the Kings Road location for November and December 2001. November and December 2001 PM_{2.5} results for the Henry Street (12.1 µg/m³) location were lower than the Hamilton (15.2 µg/m³) and Montreal (12.4 µg/m³) average levels for November and December 2000. PM_{2.5} results for the Kings Road (20.8 µg/m³) location were higher than the Hamilton (15.2 µg/m³) and Montreal (12.4 µg/m³) average levels. PM_{2.5} results for the Intercolonial Street (13.9 µg/m³) location were lower than the Hamilton (15.2 µg/m³) and higher than the Montreal (12.4 µg/m³) average levels.

Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽⁶⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Montreal ⁽⁶⁾ (µg/m ³)	Regulatory Guidelines ⁽²⁾		Number of Exceedances	Separation Zone Short Term Criteria ⁽⁵⁾ (µg/m ³)
									24-hour (µg/m ³)			
PM ₁₀	7.6	3.8	13.1	3.8	6	100	22.8	19.2	50 ⁽³⁾		0	25.0
Aluminum	-- ⁽⁴⁾	< 0.1	< 0.1	--	6	0	Na ⁽¹⁾	na	na		na	na
Antimony	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Barium	--	< 0.01	< 0.01	--	6	0	na	na	na		na	na
Beryllium	--	< 0.001	< 0.001	--	6	0	na	na	na		na	--
Boron	--	< 0.1	< 0.1	--	6	0	na	na	na		na	na
Cadmium	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Chromium	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Cobalt	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Calcium	--	< 0.3	< 0.4	--	6	0	na	na	na		na	na
Copper	0.01	< 0.01	0.03	0.01	6	67	na	na	na		na	na
Iron	0.1	< 0.1	0.1	0.0	6	33	na	na	na		na	na
Lead	0.001	< 0.001	0.004	0.001	6	33	na	na	na		na	na
Lithium	--	< 0.001	< 0.001	--	6	0	na	na	na		na	--
Manganese	--	< 0.01	< 0.01	--	6	0	na	na	na		na	--
Molybdenum	--	< 0.01	< 0.01	--	6	0	na	na	na		na	na
Nickel	0.003	< 0.003	0.005	0.002	6	33	na	na	na		na	na
Silver	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Sodium	0.3	< 0.3	0.6	0.2	6	33	na	na	na		na	na
Thallium	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Tin	--	< 0.01	< 0.01	--	6	0	na	na	na		na	na
Uranium	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Vanadium	0.001	< 0.001	0.002	0.001	6	16	na	na	na		na	na
Zinc	--	< 0.1	< 0.1	--	6	0	na	na	na		na	na
Strontium	--	< 0.003	< 0.003	--	6	0	na	na	na		na	na
Magnesium	0.1	< 0.1	0.1	0.0	6	16	na	na	na		na	na
Potassium	--	< 0.3	< 0.4	--	6	0	na	na	na		na	na
Sulphur	--	< 2.1	< 2.3	--	6	0	na	na	na		na	na
Arsenic	0.001	< 0.001	0.004	0.001	6	33	na	na	na		na	--
Selenium	--	< 0.001	< 0.001	--	6	0	na	na	na		na	na
Mercury	--	< 0.0001	< 0.003	--	6	0	na	na	na		na	na

- Notes:
- na denotes not available.
 - Guidelines obtained from Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
 - Values obtained from the Canadian Environmental Protection Agency for a 24-hour averaging period.
 - denotes not applicable.
 - Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
 - Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2000) and Montreal (2000).

TABLE 27 Fixed Station Ambient Air Monitoring Program November and December PM₁₀/Metal Results Location 2: Frederick Street

Fixed Station Ambient Air Monitoring Program November and December 1999 Monitoring Results Location 2: 1 Redoubt Street													
Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Nov/Dec 2000 Average (µg/m ³)	Typical Nov/Dec Average Levels in Hamilton ⁽⁴⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Montreal ⁽⁴⁾ (µg/m ³)	Regulatory Guidelines ⁽²⁾		Number of Exceedances	Separation Zone Short Term Criteria ⁽⁵⁾ (µg/m ³)
										24-hour (µg/m ³)			
PM ₁₀	9.5	6.00	14.32	3.5	6	100	9.15	22.8	19.2	50 ⁽³⁾		0	25.0
Aluminum	-- ⁽⁴⁾	< 0.1	< 0.1	--	6	0	1.0684	na ⁽¹⁾	na	na	na	na	na
Antimony	--	< 0.001	< 0.001	--	6	0	< 0.0006	na	na	na	na	na	na
Barium	--	< 0.01	< 0.01	--	6	0	0.0753	na	na	na	na	na	na
Beryllium	--	< 0.001	< 0.001	--	6	0	0.0005	na	na	na	na	na	--
Boron	--	< 0.1	< 0.1	--	6	0	0.3409	na	na	na	na	na	na
Cadmium	--	< 0.001	< 0.001	--	6	0	0.0001	na	na	na	na	na	na
Chromium	--	< 0.001	< 0.001	--	6	0	0.0022	na	na	na	na	na	na
Cobalt	--	< 0.001	< 0.001	--	6	0	< 0.0006	na	na	na	na	na	na
Calcium	--	< 0.4	< 0.4	--	6	0	2.1307	na	na	na	na	na	na
Copper	0.03	< 0.01	0.06	0.02	6	67	0.0523	na	na	na	na	na	na
Iron	0.1	< 0.1	0.2	0.1	6	16	0.1242	na	na	na	na	na	na
Lead	0.002	< 0.001	0.005	0.002	6	33	0.0028	na	na	na	na	na	--
Lithium	--	< 0.001	< 0.001	--	6	0	0.0044	na	na	na	na	na	na
Manganese	--	< 0.01	< 0.01	--	6	0	0.0088	na	na	na	na	na	--
Molybdenum	--	< 0.01	< 0.01	--	6	0	< 0.0120	na	na	na	na	na	na
Nickel	0.002	< 0.003	0.003	0.001	6	16	0.0014	na	na	na	na	na	na
Silver	--	< 0.001	< 0.001	--	6	0	0.0001	na	na	na	na	na	na
Sodium	0.3	< 0.4	0.5	0.1	6	16	1.0698	na	na	na	na	na	na
Thallium	--	< 0.001	< 0.001	--	6	0	< 0.0006	na	na	na	na	na	na
Tin	--	< 0.01	< 0.01	--	6	0	0.0007	na	na	na	na	na	na
Uranium	--	< 0.001	< 0.001	--	6	0	0.0001	na	na	na	na	na	na
Vanadium	--	< 0.001	< 0.001	--	6	0	0.0016	na	na	na	na	na	na
Zinc	--	< 0.1	< 0.1	--	6	0	0.1361	na	na	na	na	na	na
Strontium	--	< 0.003	< 0.003	--	6	0	0.0250	na	na	na	na	na	na
Magnesium	0.1	< 0.1	0.1	0.0	6	16	0.5129	na	na	na	na	na	na
Potassium	--	< 0.4	< 0.4	--	6	0	0.2826	na	na	na	na	na	na
Sulphur	--	< 2.2	< 2.3	--	6	0	0.4923	na	na	na	na	na	na
Arsenic	0.002	< 0.001	0.003	0.001	6	67	0.0023	na	na	na	na	na	--
Selenium	--	< 0.001	< 0.001	--	6	0	0.0012	na	na	na	na	na	na
Mercury	--	< 0.0001	< 0.003	--	6	0	< 0.0006	na	na	na	na	na	na

Notes:

- (1) na denotes not available.
- (2) Guidelines obtained from Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
- (3) Values obtained from the Canadian Environmental Protection Agency for a 24-hour averaging period.
- (4) -- denotes not applicable.
- (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2000) and Montreal (2000).

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TABLE 28 Fixed Station Ambient Air Monitoring Program November and December PM₁₀/Metal Results Location 6: DesBarres Street

TABLE 20 Fixed Station Ambient Air Monitoring Program November and December 2001 Data by Parameter and Location of Observations												
Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽⁴⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Montreal ⁽⁴⁾ (µg/m ³)	Regulatory Guidelines ⁽²⁾		Number of Exceedances	Separation Zone Short Term Criteria ⁽⁵⁾ (µg/m ³)
									24-hour (µg/m ³)			
PM ₁₀	7.8	4.6	11.4	3.2	6	100	22.8	19.2	50 ⁽³⁾		0	25.0
Aluminum	-- ⁽⁴⁾	< 0.1	< 0.1	0	6	0	na ⁽¹⁾	na	na		na	na
Antimony	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Barium	--	< 0.01	< 0.01	0	6	0	na	na	na		na	na
Beryllium	--	< 0.001	< 0.001	0	6	0	na	na	na		na	--
Boron	--	< 0.1	< 0.1	0	6	0	na	na	na		na	na
Cadmium	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Chromium	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Cobalt	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Calcium	--	< 0.4	< 0.4	0	6	0	na	na	na		na	na
Copper	0.11	< 0.01	0.54	0.21	6	83	na	na	na		na	na
Iron	--	< 0.1	< 0.1	0	6	0	na	na	na		na	na
Lead	0.001	< 0.001	0.003	0.001	6	33	na	na	na		na	--
Lithium	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Manganese	--	< 0.01	< 0.01	0	6	0	na	na	na		na	--
Molybdenum	--	< 0.01	< 0.01	0	6	0	na	na	na		na	na
Nickel	--	< 0.003	< 0.003	0	6	0	na	na	na		na	na
Silver	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Sodium	0.3	< 0.4	0.7	0.2	6	33	na	na	na		na	na
Thallium	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Tin	--	< 0.01	< 0.01	0	6	0	na	na	na		na	na
Uranium	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Vanadium	0.003	< 0.001	0.014	0.005	6	33	na	na	na		na	na
Zinc	--	< 0.1	< 0.1	0	6	0	na	na	na		na	na
Strontium	--	< 0.003	< 0.003	0	6	0	na	na	na		na	na
Magnesium	--	< 0.1	< 0.1	0	6	0	na	na	na		na	na
Potassium	--	< 0.4	< 0.4	0	6	0	na	na	na		na	na
Sulphur	--	< 2.3	< 2.3	0	6	0	na	na	na		na	na
Arsenic	0.002	< 0.001	0.007	0.002	6	67	na	na	na		na	--
Selenium	--	< 0.001	< 0.001	0	6	0	na	na	na		na	na
Mercury	--	< 0.0001	< 0.003	0.002	6	0	na	na	na		na	na

Notes:

- (1) na denotes not available.
- (2) Guidelines obtained from Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
- (3) Values obtained from the Canadian Environmental Protection Agency for a 24-hour averaging period.
- (4) -- denotes not applicable.
- (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2000) and Montreal (2000).

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TABLE 29 Fixed Station Ambient Air Monitoring Program November and December PM_{2.5}/Metal Results Location 3: Henry Street

Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽⁷⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Montreal ⁽⁷⁾ (µg/m ³)	Regulatory Guidelines ⁽³⁾		Separation Zone Short Term Criteria ⁽⁶⁾ (µg/m ³)
									24-hour (µg/m ³)	Number of Exceedances	
PM _{2.5}	12.1	<20.8	20.8	4.2	6	16	15.2	12.4	30 ⁽⁴⁾	0	NA ⁽²⁾
Aluminum	-- ⁽⁵⁾	< 0.83	< 0.83	--	6	0	na ⁽¹⁾	na	na	na	na
Antimony	--	< 0.0166	< 0.0166	--	6	0	na	na	na	na	na
Barium	--	< 0.0166	< 0.0166	--	6	0	na	na	na	na	na
Beryllium	--	< 0.0208	< 0.0208	--	6	0	na	na	na	na	--
Boron	--	< 0.4	< 0.4	--	6	0	na	na	na	na	na
Cadmium	--	< 0.0125	< 0.0125	--	6	0	na	na	na	na	na
Chromium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Cobalt	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na
Calcium	--	< 4.2	< 4.2	--	6	0	na	na	na	na	na
Copper	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Iron	--	< 4.2	< 4.2	--	6	0	na	na	na	na	--
Lead	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na
Lithium	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na
Manganese	--	< 0.166	< 0.166	--	6	0	na	na	na	na	--
Molybdenum	--	< 0.166	< 0.166	--	6	0	na	na	na	na	na
Nickel	--	< 0.125	< 0.125	--	6	0	na	na	na	na	na
Silver	--	< 0.0083	< 0.0832	--	6	0	na	na	na	na	na
Sodium	--	< 12.5	< 12.5	--	6	0	na	na	na	na	na
Thallium	--	< 0.0333	< 0.0333	--	6	0	na	na	na	na	na
Tin	--	< 0.83	< 0.83	--	6	0	na	na	na	na	na
Uranium	--	< 0.00624	< 0.00624	--	6	0	na	na	na	na	na
Vanadium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Zinc	0.069	< 0.083	0.208	0.068	6	16	na	na	na	na	na
Strontium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Magnesium	--	< 2.49	< 2.49	--	6	0	na	na	na	na	na
Potassium	--	< 24.9	< 24.9	--	6	0	na	na	na	na	na
Sulphur	--	< 153.8	< 153.8	--	6	0	na	na	na	na	na
Arsenic	--	< 0.0249	< 0.0249	--	6	0	na	na	na	na	--
Selenium	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na
Mercury	--	< 0.0042	< 0.0042	--	6	0	na	na	na	na	na

Notes:

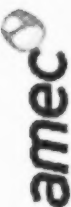
- (1) na denotes not available.
(2) NA denotes not applicable.
(3) Guidelines obtained from Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
(4) (4) Values obtained from the Canadian Environmental Protection Agency for a 24-hour averaging period.
(5) -- denotes not applicable.
(6) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
(7) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2000) and Montreal (2000).

TABLE 30 Fixed Station Ambient Air Monitoring Program November and December PM_{2.5}/Metal Results Location 4: Kings Road

Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽⁷⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Montreal ⁽⁷⁾ (µg/m ³)	Regulatory Guidelines ⁽³⁾		Separation Zone Short Term Criteria ⁽⁶⁾ (µg/m ³)
									24-hour (µg/m ³)	Number of Exceedances	
PM _{2.5}	20.8	< 20.8	33.3	9.0	6	50	15.2	12.4	30 ⁽⁴⁾	0	NA ⁽²⁾
Aluminum	-- ⁽⁵⁾	< 0.83	< 0.83	--	6	0	na ⁽¹⁾	na	na	na	na
Antimony	--	< 0.0166	< 0.0166	--	6	0	na	na	na	na	na
Barium	0.0547	< 0.0166	< 0.2453	0.0934	6	16	na	na	na	na	na
Beryllium	--	< 0.0208	< 0.0208	--	6	0	na	na	na	na	--
Boron	--	< 4.2	< 4.2	--	6	0	na	na	na	na	na
Cadmium	--	< 0.0125	< 0.0125	--	6	0	na	na	na	na	na
Chromium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Cobalt	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na
Calcium	--	< 4.2	< 4.2	--	6	0	na	na	na	na	na
Copper	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Iron	--	< 4.2	< 4.2	--	6	0	na	na	na	na	--
Lead	0.087	< 0.042	0.416	0.161	6	16	na	na	na	na	na
Lithium	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na
Manganese	--	< 0.166	< 0.166	--	6	0	na	na	na	na	--
Molybdenum	--	< 0.166	< 0.166	--	6	0	na	na	na	na	na
Nickel	--	< 0.125	< 0.125	--	6	0	na	na	na	na	na
Silver	--	< 0.0083	< 0.0083	--	6	0	na	na	na	na	na
Sodium	--	< 12.5	< 12.5	--	6	0	na	na	na	na	na
Thallium	--	< 0.0333	< 0.0333	--	6	0	na	na	na	na	na
Tin	--	< 0.83	< 0.83	--	6	0	na	na	na	na	na
Uranium	--	< 0.00624	< 0.00624	--	6	0	na	na	na	na	na
Vanadium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Zinc	0.069	< 0.083	0.125	0.043	6	33	na	na	na	na	na
Strontium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na
Magnesium	--	< 2.49	< 2.49	--	6	0	na	na	na	na	na
Potassium	--	< 24.9	< 24.9	--	6	0	na	na	na	na	na
Sulphur	--	< 153.8	< 153.8	--	6	0	na	na	na	na	na
Arsenic	--	< 0.0249	< 0.0249	--	6	0	na	na	na	na	--
Selenium	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na
Mercury	--	< 0.0042	< 0.0042	--	6	0	na	na	na	na	na

Notes:

- (1) na denotes not available.
(2) NA denotes not applicable.
(3) Guidelines obtained from Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
(4) (4) Values obtained from the Canadian Environmental Protection Agency for a 24-hour averaging period.
(5) -- denotes not applicable.
(6) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
(7) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2000) and Montreal (2000).



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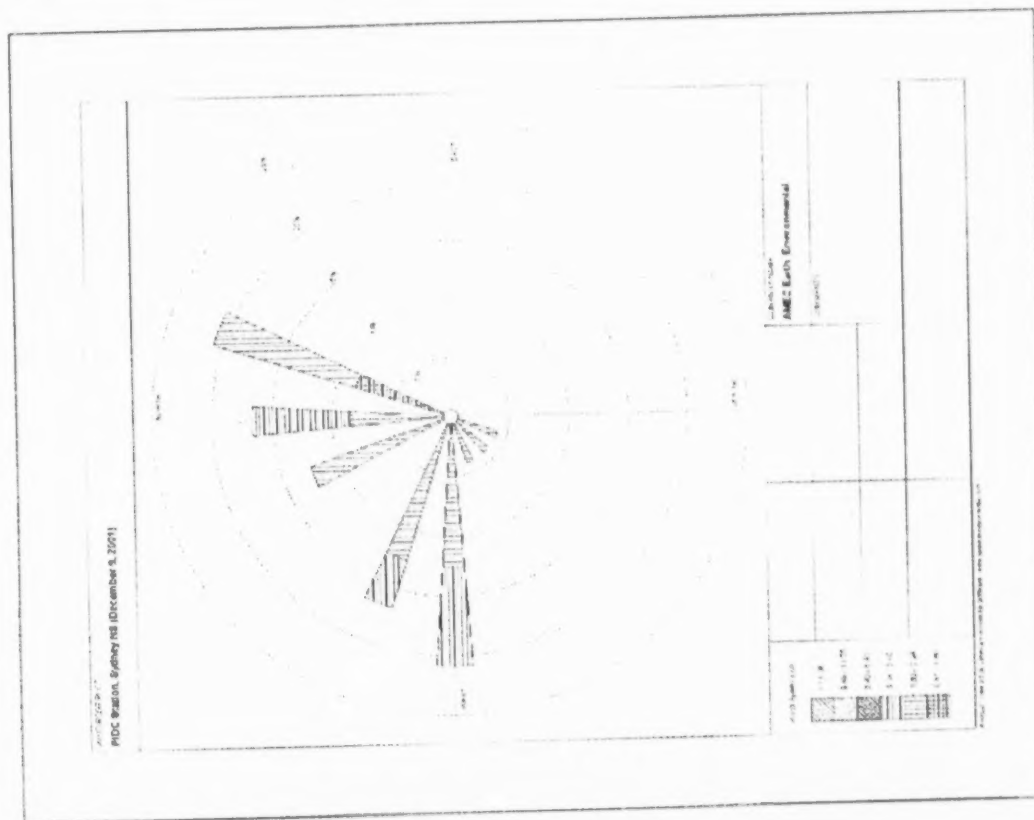
Muggah Creek Remediation Project, Sydney, NS
NS Department of Transportation and Public Works
August 2002

TABLE 31 Fixed Station Ambient Air Monitoring Program November and December PM_{2.5}/Metal Result Location 5: Intercolonial Street

TABLE 31 Fixed Station Ambient Air Monitoring Program November and December PM _{2.5} /Metal Result Location 3: Inter-Industrial Street												
Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽¹⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Montreal ⁽¹⁾ (µg/m ³)	Regulatory Guidelines ⁽³⁾		Number of Exceedances	Separation Zone Short Term Criteria ⁽⁶⁾ (µg/m ³)
									24-hour (µg/m ³)			
PM _{2.5}	13.9	< 20.8	20.8	5.4	6	33	15.2	12.4	30 ⁽⁴⁾	0		NA ⁽²⁾
Aluminum	-- ⁽⁵⁾	< 0.83	< 0.83	--	6	0	na ⁽¹⁾	na	na	na	na	na
Antimony	--	< 0.0166	< 0.0166	--	6	0	na	na	na	na	na	na
Barium	0.0173	< 0.0166	< 0.0208	0.0017	6	16	na	na	na	na	na	--
Beryllium	--	< 0.0208	< 0.0208	--	6	0	na	na	na	na	na	na
Boron	--	< 4.2	< 4.2	--	6	0	na	na	na	na	na	na
Cadmium	--	< 0.0125	< 0.0125	--	6	0	na	na	na	na	na	na
Chromium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na	na
Cobalt	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na	na
Calcium	--	< 4.2	< 4.2	--	6	0	na	na	na	na	na	na
Copper	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na	na
Iron	--	< 4.2	< 4.2	--	6	0	na	na	na	na	na	--
Lead	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na	na
Lithium	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na	--
Manganese	--	< 0.166	< 0.166	--	6	0	na	na	na	na	na	na
Molybdenum	--	< 0.166	< 0.166	--	6	0	na	na	na	na	na	na
Nickel	--	< 0.125	< 0.125	--	6	0	na	na	na	na	na	na
Silver	0.0083	< 0.0083	0.0291	0.0102	6	16	na	na	na	na	na	na
Sodium	--	< 12.5	< 12.5	--	6	0	na	na	na	na	na	na
Thallium	--	< 0.0333	< 0.0333	--	6	0	na	na	na	na	na	na
Tin	--	< 0.83	< 0.83	--	6	0	na	na	na	na	na	na
Uranium	--	< 0.0624	< 0.0624	--	6	0	na	na	na	na	na	na
Vanadium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na	na
Zinc	0.069	< 0.083	0.125	0.034	6	50	na	na	na	na	na	na
Strontium	--	< 0.083	< 0.083	--	6	0	na	na	na	na	na	na
Magnesium	--	< 2.49	< 2.49	--	6	0	na	na	na	na	na	na
Potassium	--	< 24.9	< 24.9	--	6	0	na	na	na	na	na	na
Sulphur	--	< 153.8	< 153.8	--	6	0	na	na	na	na	na	--
Arsenic	--	< 0.0249	< 0.0249	--	6	0	na	na	na	na	na	na
Selenium	--	< 0.042	< 0.042	--	6	0	na	na	na	na	na	na
Mercury	--	< 0.0042	< 0.0042	--	6	0	na	na	na	na	na	na

Notes:

- (1) na denotes not available.
- (2) NA denotes not applicable.
- (3) Guidelines obtained from Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
- (4) Values obtained from the Canadian Environmental Protection Agency for a 24-hour averaging period.
- (5) -- denotes not applicable.
- (6) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
- (7) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (2000) and Montreal (2000).



4.4.3 VOCs

Tables 32 to 37 provide a summary of VOC results for the six Fixed Station AAMP sampling locations for November and December. The Ontario MOE provides 24-hour AAQC for many of the VOC parameters contained in Tables 31 to 36. There are no exceedances to the 24-hour MOE AAQC during the monitoring performed in November and December for the VOC parameters for which AAQC are available.

Benzene values ranged from $<0.54 \mu\text{g}/\text{m}^3$ to $2.17 \mu\text{g}/\text{m}^3$ at Victoria Road, which is comparable to the evacuated canister benzene values reported in the March, June, August and September 2001 sampling periods ($0.56 - 2.33 \mu\text{g}/\text{m}^3$), associated with the Portable GC sampling Program and Technology Demonstration Program.

There were more detected VOC compounds at Victoria Road and Frederick Street in November and December 2001, than for the same time period in 2000. This resulted in higher average VOC values for 2001 for most compounds, except for benzene and 1,2,4-trichlorobenzene at the Frederick Street location, which were lower in November and December 2001 are higher than the results for the same time period in 2000. The dichloromethane parameter is the most noticeably different with an average November and December concentration of $19.74 \mu\text{g}/\text{m}^3$ for 2001 versus $<0.2 \mu\text{g}/\text{m}^3$ for 2000. It is likely, however, that this compound is attributable to background levels in the laboratory. The detected VOC compounds are well below the referenced guidelines.

Tables 32 to 37 also contain average VOC levels for the city of Hamilton, Ontario (November and December 1999) and Halifax, Nova Scotia (November and December 1998). The data was obtained from the Environment Canada database and was compiled by AMEC.

Generally, compounds measured in the Sydney airshed, such as benzene, toluene and o,m,p xylenes, that are known to be site contaminants for both the Coke Ovens site and Tar Ponds were below levels found in the Hamilton 1999 and Halifax 1998 airsheds. Other VOCs including vinyl chloride, chloroethane, 1,2 dichloroethane, bromomethane, trichlorofluoromethane, chloroform, trichloroethene, and 1,2,4 trichlorobenzene were generally marginally higher at all the Sydney monitoring locations when compared to the Hamilton and Halifax average levels. The VOCs dichloromethane and styrene are appreciably higher at the Sydney locations compared to Hamilton and Halifax levels. The difference in dichloromethane levels can be attributed to laboratory contamination.

TABLE 32 Fixed Station Ambient Air Monitoring Program, November and December VOC Results Location 1: Victoria Road

Parameter	Nov/Dec 2001 Average ($\mu\text{g}/\text{m}^3$)	Minimum Value ($\mu\text{g}/\text{m}^3$)	Maximum Value ($\mu\text{g}/\text{m}^3$)	Standard Deviation	Number of Samples	% Detected	Nov/Dec 2000 Average ($\mu\text{g}/\text{m}^3$)	Typical Nov/Dec Average Levels in Hamilton ^(e) ($\mu\text{g}/\text{m}^3$)	Typical Nov/Dec Average Levels in Halifax ^(e) ($\mu\text{g}/\text{m}^3$)	Regulatory Guideline ^(b)	Number of Exceedances	Separation Zone Short Term Criteria ^(c) ($\mu\text{g}/\text{m}^3$)
Dichlorodifluoromethane	1.31	0.71	3.11	1.20	4	100	<0.2	2.66	2.67	500,000	0	na ⁽¹⁾
Chloromethane	1.3	0.6	2.5	0.9	4	100	<0.19	1.05	1.08	7000	0	na
Halocarbon 114	-- ^(d)	<1.19	<4.75	--	4	0	<0.17	0.22	0.14	700,000	0	na
Vinyl chloride	0.20	<0.20	0.41	0.15	4	25	0.11	0.02	0.01	1.0	0	na
Chloroethane	--	<0.24	<0.95	--	4	0	<0.09	0.09	0.02	na	0	na
1,2-Dichloroethane	0.68	<0.61	1.22	0.38	4	50	<0.15	0.07	0.05	na	NA ^(a)	na
Bromomethane	0.39	<0.35	0.70	0.22	4	50	<0.09	0.14	0.08	1,350	0	na
Trichlorofluoromethane	2.56	1.35	3.15	0.82	4	100	<0.14	1.61	1.67	6,000	0	na
1,1-Dichloroethene	--	<0.75	<3.01	--	4	0	<0.19	0.06	0.01	35	0	na
cis-1,1-Dichloroethene	--	<0.56	<2.22	--	4	0	<0.14	na	na	na	NA	na
1,1-Dichloroethane	--	<0.69	<2.75	--	4	0	<0.19	0.04	0.01	200	0	na
1,2-Dichloropropane	--	<0.69	<2.77	--	4	0	<0.15	0.04	0.03	na	NA	na
Dichloromethane	26	4	52	20	4	100	<0.2	1.04	0.75	1,765	0	na
Chloroform	1.01	<0.73	2.93	1.28	4	25	<0.15	0.11	0.14	500	0	na
1,1,2,2-Tetrachloroethane	--	<1.51	<6.04	--	4	0	<0.18	0.06	0.02	na	NA	na
Halocarbon 113	1.65	1.07	2.30	0.67	4	75	0.58	14.79	0.69	80,000	0	na
1,1,1-Trichloroethane	--	<0.76	<3.06	--	4	0	<0.14	0.38	0.41	115,000	0	na
1,1,2-Trichloroethane	--	<0.65	<2.62	--	4	0	<0.12	0.04	0.03	na	NA	na
Toluene	1.63	1.02	2.94	0.88	4	100	0.69	4.35	4.24	2,000	0	760
Benzene	1.05	0.54	2.17	0.75	4	100	0.25	1.41	2.14	na	7	na
cis-1,3-Dichloropropene	--	<0.64	<2.54	--	4	0	<0.14	na	na	na	NA	na
trans-1,3-Dichloropropene	--	<0.50	<2.00	--	4	0	<0.14	0.02	0.01	na	NA	na
Trichloroethene	0.96	<0.70	2.79	1.22	4	25	<0.13	0.13	0.06	28,000	0	na
Tetrachloroethene	1.40	<1.02	4.07	1.78	4	25	<0.15	0.94	0.17	na	NA	na
Carbon tetrachloride	--	<0.94	<3.77	--	4	0	<0.15	0.61	0.66	600	0	na
Ethylene dibromide	--	<1.15	<4.61	--	4	0	<0.15	0.06	0.01	3	0	na
Ethylbenzene	--	<0.65	<2.61	--	4	0	<0.15	0.77	0.83	4,000	0	200
m&p-Xylene	1.52	<1.00	3.99	1.67	4	50	<0.2	2.12	2.89	2,300	0	36
o-Xylene	0.82	<0.82	1.65	0.58	4	25	<0.19	0.68	1.03	na	0	na
1,3,5-Trimethylbenzene	--	<1.3	<4.9	--	4	0	<0.16	0.27	0.30	na	NA	na
1,2,4-Trimethylbenzene	--	<1.2	<4.9	--	4	0	<0.17	0.88	0.87	1,000	0	na
1,3-Dichlorobenzene	--	<1.5	<6.0	--	4	0	<0.15	0.02	0.02	na	NA	na
1,4-Dichlorobenzene	--	<1.7	<7.2	--	4	0	<0.19	0.19	0.18	na	NA	na
1,2-Dichlorobenzene	--	<1.7	<7.2	--	4	0	<0.2	0.02	0.02	39,500	0	na
1,2,4-Trichlorobenzene	1.63	<1.19	4.75	2.08	4	25	<0.16	0.05	0.05	400	0	na
Hexachlorobutadiene	--	<3.5	<13.9	--	4	0	<0.15	0.09	0.09	na	NA	na
Chlorobenzene	--	<0.69	<2.76	--	4	0	<0.13	0.01	0.01	3,500	0	na
Styrene	13.8	<8.5	34.1	13.6	4	75	<0.19	0.17	0.01	400	0	na

- Notes:
- (1) na denotes not available.
 - (2) NA denotes not applicable.
 - (3) Values represent guidelines established by the Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
 - (4) -- denotes not applicable.
 - (5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
 - (6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (1999) and Halifax (1998).

TABLE 33 Fixed Station Ambient Air Monitoring Program November and December VOC Results Location 2: Frederick Street

TABLE 3.3 Fixed Station Ambient Air Monitoring Program November and December 2000 Results Location 2.1: Nelson Street													
Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Nov/Dec 2000 Average (µg/m ³)	Typical Average Levels in Hamilton ^(a) (µg/m ³)	Typical Average Levels in Halifax ^(a) (µg/m ³)	Regulatory Guideline ^(b)		Number of Exceedances	Separation Zone Short Term Criteria ^(c) (µg/m ³)
										24-hour (µg/m ³)			
Dichlorodifluoromethane	1.15	0.71	2.48	0.76	5	100	<0.2	2.66	2.67	500,000	0	0	na ⁽¹⁾
Chloromethane	1.0	<0.6	2.5	0.9	5	80	<0.19	1.05	1.08	7000	0	0	na
Halocarbon 114	-- ^(d)	<1.19	<1.19	--	5	0	<0.17	0.22	0.14	700,000	0	0	na
Vinyl chloride	0.12	<0.20	0.20	0.05	5	20	<0.08	0.02	0.01	1.0	0	0	na
Chloroethane	0.14	<0.24	0.24	0.05	5	20	<0.09	0.09	0.02	na	NA ^(e)	0	na
1,2-Dichloroethane	0.89	<0.61	2.91	1.14	5	40	<0.15	0.07	0.05	na	NA	0	na
Bromomethane	0.24	<0.35	0.35	0.10	5	40	<0.09	0.14	0.08	1,350	0	0	na
Trichlorofluoromethane	2.00	1.18	3.43	0.86	5	100	<0.14	1.61	1.67	6,000	0	0	na
1,1-Dichloroethene	--	<0.75	<0.75	--	5	0	<0.19	0.06	0.01	35	0	0	na
cis-1,1-Dichloroethene	--	<0.56	<0.56	--	5	0	0.24	na	na	na	NA	0	na
1,1-Dichloroethane	--	<0.69	<0.69	--	5	0	<0.19	0.04	0.01	200	0	0	na
1,2-Dichloropropane	--	<0.69	<0.69	--	5	0	<0.15	0.04	0.03	na	NA	0	na
Dichloromethane	20	1	76	32	5	100	<0.2	1.04	0.75	1,765	0	0	na
Chloroform	0.44	<0.73	0.73	0.16	5	20	<0.15	0.11	0.14	500	0	0	na
1,1,2,2-Tetrachloroethane	--	<1.51	<1.51	--	5	0	<0.18	0.06	0.02	na	NA	0	na
Halocarbon 113	1.35	<1.07	2.22	0.67	5	80	<0.14	14.79	0.69	80,000	0	0	na
1,1,1-Trichloroethane	0.46	<0.76	0.76	0.17	5	20	<0.14	0.38	0.41	115,000	0	0	na
1,1,2-Trichloroethane	--	<0.65	<0.65	--	5	0	<0.12	0.04	0.03	na	NA	0	na
Toluene	3.7	1.1	12.8	5.1	5	100	0.49	4.35	4.24	2,000	0	0	760
Benzene	0.92	0.54	1.34	0.32	5	100	2.48	1.41	2.14	na	NA	0	7
cis-1,3-Dichloropropene	--	<0.64	<0.64	--	5	0	<0.14	na	na	na	NA	0	na
trans-1,3-Dichloropropene	--	<0.50	<0.50	--	5	0	<0.14	0.02	0.01	na	NA	0	na
Trichloroethene	0.73	<0.70	1.56	0.55	5	40	<0.13	0.13	0.06	28,000	0	0	na
Tetrachloroethene	0.64	<1.02	1.15	0.29	5	20	<0.15	0.94	0.17	na	NA	0	na
Carbon tetrachloride	--	<0.94	<0.94	--	5	0	<0.15	0.61	0.66	600	0	0	na
Ethylene dibromide	--	<1.15	<1.15	--	5	0	<0.15	0.06	0.01	3	0	0	na
Ethylbenzene	--	<0.65	<0.65	--	5	0	<0.15	0.77	0.83	4,000	0	0	200
m&p-Xylene	0.84	<1.00	1.22	0.33	5	60	<0.2	2.12	2.89	2,300	0	0	36
o-Xylene	0.49	<0.82	0.82	0.19	5	20	<0.19	0.68	1.03	na	0	0	na
1,3,5-Trimethylbenzene	--	<1.28	<1.28	--	5	0	<0.16	0.27	0.30	na	NA	0	na
1,2,4-Trimethylbenzene	--	<1.23	<1.23	--	5	0	<0.17	0.88	0.87	1,000	0	0	na
1,3-Dichlorobenzene	--	<1.50	<1.50	--	5	0	<0.15	0.02	0.02	na	NA	0	na
1,4-Dichlorobenzene	--	<1.74	<1.74	--	5	0	<0.19	0.19	0.18	na	NA	0	na
1,2-Dichlorobenzene	--	<1.74	<1.74	--	5	0	<0.2	0.02	0.02	39,500	0	0	na
1,2,4-Trichlorobenzene	0.80	<1.19	1.63	0.46	5	20	2.40	0.05	0.05	400	0	0	na
Hexachlorobutadiene	--	<3.52	<3.52	--	5	0	1.12	0.09	0.09	na	NA	0	na
Chlorobenzene	--	<0.69	<0.69	--	5	0	<0.13	0.01	0.01	3,500	0	0	na
Styrene	6.82	<8.52	8.52	2.33	5	60	2.29	0.17	0.01	400	0	0	na

Notes:
(1) na denotes not available.
(2) NA denotes not applicable.
(3) Values represent guidelines established the Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
(4) -- denotes not applicable.
(5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
(6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (1999) and Halifax (1998).

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TABLE 34 Fixed Station Ambient Air Monitoring Program November and December VOC Results Location 3: Henry Street

TABLE 34 FIXED STATION AMBIENT AIR MONITORING PROGRAM NOVEMBER AND DECEMBER 2001 RESULTS - LOCATION 07 - STREET												
Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ^(a) (µg/m ³)	Typical Nov/Dec Average Levels in Halifax ^(a) (µg/m ³)	Regulatory Guideline ^(b)		Number of Exceedances	Separation Zone Short Term Criteria ^(c) (µg/m ³)
									24-hour (µg/m ³)			
Dichlorodifluoromethane	0.78	<0.71	1.49	0.37	6	83	2.66	2.67	500,000	0	0	na ⁽¹⁾
Chloromethane	0.55	<0.60	0.93	0.23	6	67	1.05	1.08	7000	0	0	na
Halocarbon 114	-- ^(d)	<1.19	<1.19	--	6	0	0.22	0.14	700,000	0	0	na
Vinyl chloride	0.13	<0.20	0.26	0.06	6	17	0.02	0.01	1.0	0	0	na
Chloroethane	0.14	<0.24	0.24	0.05	6	17	0.09	0.02	na	NA ⁽²⁾	0	na
1,2-Dichloroethane	0.41	<0.61	0.61	0.16	6	33	0.07	0.05	na	NA	0	na
Bromomethane	0.26	<0.35	0.50	0.14	6	33	0.14	0.08	1,350	0	0	na
Trichlorofluoromethane	1.84	1.40	2.42	0.36	6	100	1.61	1.67	6,000	0	0	na
1,1-Dichloroethene	--	<0.75	<0.75	--	6	0	0.06	0.01	35	0	0	na
cis-1,1-Dichloroethene	--	<0.56	<0.56	--	6	0	na	na	na	NA	0	na
1,1-Dichloroethane	--	<0.69	<0.69	--	6	0	0.04	0.01	200	0	0	na
1,2-Dichloropropane	--	<0.69	<0.69	--	6	0	0.04	0.03	na	NA	0	na
Dichloromethane	23	1	59	23	6	100	1.04	0.75	1,765	0	0	na
Chloroform	0.49	<0.73	1.12	0.31	6	17	0.11	0.14	500	0	0	na
1,1,2,2-Tetrachloroethane	--	<1.51	<1.51	--	6	0	0.06	0.02	na	NA	0	na
Halocarbon 113	0.96	<1.07	1.46	0.36	6	67	14.79	0.69	80,000	0	0	na
1,1,1-Trichloroethane	0.44	<0.76	0.76	0.16	6	17	0.38	0.41	115,000	0	0	na
1,1,2-Trichloroethane	--	<0.65	<0.65	--	6	0	0.04	0.03	na	NA	0	na
Toluene	3.0	0.7	8.7	2.9	6	100	4.35	4.24	2,000	0	0	760
Benzene	0.99	0.54	1.41	0.32	6	100	1.41	2.14	na	NA	0	7
cis-1,3-Dichloropropene	--	<0.64	<0.64	--	6	0	na	na	na	NA	0	na
trans-1,3-Dichloropropene	--	<0.50	<0.50	--	6	0	0.02	0.01	na	NA	0	na
Trichloroethene	0.66	<0.70	1.67	0.54	6	33	0.13	0.06	28,000	0	0	na
Tetrachloroethene	0.61	<1.02	1.09	0.23	6	17	0.94	0.17	na	NA	0	na
Carbon tetrachloride	--	<0.94	<0.94	--	6	0	0.61	0.66	600	0	0	na
Ethylene dibromide	0.70	<1.15	1.31	0.30	6	17	0.06	0.01	3	0	0	na
Ethylbenzene	--	<0.65	<0.65	--	6	0	0.77	0.83	4,000	0	0	200
m,p-Xylene	0.90	<1.00	1.22	0.32	6	67	2.12	2.89	2,300	0	0	36
o-Xylene	0.48	<0.82	0.82	0.17	6	17	0.68	1.03	na	NA	0	na
1,3,5-Trimethylbenzene	--	<1.28	<1.28	--	6	0	0.27	0.30	na	NA	0	na
1,2,4-Trimethylbenzene	--	<1.23	<1.23	--	6	0	0.88	0.87	1,000	0	0	na
1,3-Dichlorobenzene	--	<1.50	<1.50	--	6	0	0.02	0.02	na	NA	0	na
1,4-Dichlorobenzene	--	<1.74	<1.74	--	6	0	0.19	0.18	na	NA	0	na
1,2-Dichlorobenzene	--	<1.74	<1.74	--	6	0	0.02	0.02	39,500	0	0	na
1,2,4-Trichlorobenzene	0.69	<1.19	1.19	0.24	6	17	0.05	0.05	400	0	0	na
Hexachlorobutadiene	--	<3.52	<3.52	--	6	0	0.09	0.09	na	NA	0	na
Chlorobenzene	--	<0.69	<0.69	--	6	0	0.01	0.01	3,500	0	0	na
Styrene	6.39	<8.52	8.52	2.33	6	50	0.17	0.01	400	0	0	na

Notes:
(1) na denotes not available.
(2) NA denotes not applicable.
(3) Values represent guidelines established the Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
(4) -- denotes not applicable.
(5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
(6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (1999) and Halifax (1998).

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TABLE 35 Fixed Station Ambient Air Monitoring Program November and December VOC Results Location 4: Kings Road

Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽⁶⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Halifax ⁽⁶⁾ (µg/m ³)	Number of Exceedances		Separation Zone Short Term Criteria ⁽⁵⁾ (µg/m ³)
									Regulatory Guideline ⁽⁶⁾ 24-hour (µg/m ³)	24-hour (µg/m ³)	
Dichlorodifluoromethane	0.99	0.71	1.34	0.30	4	100	2.66	2.67	500,000	0	na ⁽¹⁾
Chloromethane	0.74	< 0.60	1.20	0.38	4	75	1.05	1.08	7000	0	na
Halocarbon 114	-- ⁽²⁾	< 1.19	< 1.19	--	4	25	0.22	0.14	700,000	0	na
Vinyl chloride	0.13	< 0.20	0.20	0.05	4	25	0.02	0.01	1.0	0	na
Chloroethane	0.15	< 0.24	0.24	0.06	4	25	0.09	0.02	na	NA ⁽²⁾	na
1,2-Dichloroethane	0.38	< 0.61	0.61	0.15	4	25	0.07	0.05	na	NA	na
Bromomethane	0.22	< 0.35	0.35	0.09	4	25	0.14	0.08	1,350	0	na
Trichlorofluoromethane	2.16	1.35	2.53	0.55	4	100	1.61	1.67	6,000	0	na
1,1-Dichloroethene	--	< 0.75	< 0.75	--	4	0	0.06	0.01	35	0	na
cis-1,1-Dichloroethene	--	< 0.56	< 0.56	--	4	0	na	na	na	NA	na
1,1-Dichloroethane	--	< 0.69	< 0.69	--	4	0	0.04	0.01	200	0	na
1,2-Dichloropropane	--	< 0.69	< 0.69	--	4	0	0.04	0.03	na	NA	na
Dichloromethane	29.1	2.0	93.8	43.6	4	100	1.04	0.75	1,765	0	na
Chloroform	0.57	< 0.73	1.17	0.40	4	25	0.11	0.14	500	0	na
1,1,2,2-Tetrachloroethane	--	< 1.51	< 1.51	--	4	0	0.06	0.02	na	NA	na
Halocarbon 113	1.25	< 1.07	1.99	0.61	4	75	14.79	0.69	80,000	0	na
1,1,1-Trichloroethane	0.61	< 0.76	1.31	0.46	4	25	0.38	0.41	115,000	0	na
1,1,2-Trichloroethane	--	< 0.65	< 0.65	--	4	0	0.04	0.03	na	NA	na
Toluene	5.1	1.2	10.9	4.2	4	100	4.35	4.24	2,000	0	760
Benzene	1.12	0.67	1.37	0.31	4	100	1.41	2.14	na	NA	7
cis-1,3-Dichloropropene	--	< 0.64	< 0.64	--	4	0	na	na	na	NA	na
trans-1,3-Dichloropropene	--	< 0.50	< 0.50	--	4	0	0.02	0.01	na	NA	na
Trichloroethene	1.41	< 0.70	3.39	1.43	4	50	0.13	0.06	28,000	0	na
Tetrachloroethene	0.70	< 1.02	1.29	0.39	4	25	0.94	0.17	na	NA	na
Carbon tetrachloride	--	< 0.94	< 0.94	--	4	0	0.61	0.66	600	0	na
Ethylene dibromide	--	< 1.15	< 1.15	--	4	0	0.06	0.01	3	0	na
Ethylbenzene	--	< 0.65	< 0.65	--	4	0	0.77	0.83	4,000	0	200
m,p-Xylene	0.86	< 1.00	1.43	0.45	4	50	2.12	2.89	2,300	0	36
o-Xylene	--	< 0.82	< 0.82	--	4	0	0.68	1.03	na	0	na
1,3,5-Trimethylbenzene	--	< 1.28	< 1.28	--	4	0	0.27	0.30	na	NA	na
1,2,4-Trimethylbenzene	--	< 1.23	< 1.23	--	4	0	0.88	0.87	1,000	0	na
1,3-Dichlorobenzene	--	< 1.50	< 1.50	--	4	0	0.02	0.02	na	NA	na
1,4-Dichlorobenzene	--	< 1.74	< 1.74	--	4	0	0.19	0.18	na	NA	na
1,2-Dichlorobenzene	--	< 1.74	< 1.74	--	4	0	0.02	0.02	39,500	0	na
1,2,4-Trichlorobenzene	0.74	< 1.19	1.19	0.30	4	25	0.05	0.05	400	0	na
Hexachlorobutadiene	--	< 3.52	< 3.52	--	4	0	0.09	0.09	na	NA	na
Chlorobenzene	--	< 0.69	< 0.69	--	4	0	0.01	0.01	3,500	0	na
Styrene	6.4	< 8.5	8.5	2.5	4	50	0.17	0.01	400	0	na

Notes:

- (1) na denotes not available.
- (2) NA denotes not applicable.
- (3) Values represent guidelines established the Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
- (4) -- denotes not applicable.
- (5) Criteria obtained from the AGRA Intern Separation Zone Document, 2000.
- (6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (1999) and Halifax (1998).

TABLE 36 Fixed Station Ambient Air Monitoring Program November and December VOC Results Location 5: Intercolonial Street

Parameter	Nov/Dec 2001 Average (µg/m ³)	Minimum Value (µg/m ³)	Maximum Value (µg/m ³)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ⁽⁶⁾ (µg/m ³)	Typical Nov/Dec Average Levels in Halifax ⁽⁶⁾ (µg/m ³)	Number of Exceedances		Separation Zone Short Term Criteria ⁽⁵⁾ (µg/m ³)
									Regulatory Guideline ⁽⁶⁾ 24-hour (µg/m ³)	24-hour (µg/m ³)	
Dichlorodifluoromethane	1.02	0.78	1.45	0.30	4	100	2.66	2.67	500,000	0	na ⁽¹⁾
Chloromethane	0.68	< 0.60	1.22	0.39	4	75	1.05	1.08	7000	0	na
Halocarbon 114	-- ⁽²⁾	< 1.19	< 1.19	--	4	0	0.22	0.14	700,000	0	na
Vinyl chloride	0.13	< 0.20	0.20	0.05	4	25	0.02	0.01	1.0	0	na
Chloroethane	0.62	< 0.24	2.11	1.00	4	25	0.09	0.02	na	NA ⁽²⁾	na
1,2-Dichloroethane	0.69	< 0.61	1.86	0.78	4	25	0.07	0.05	na	NA	na
Bromomethane	0.22	< 0.35	0.35	0.09	4	25	0.14	0.08	1,350	0	na
Trichlorofluoromethane	2.67	2.08	3.37	0.61	4	100	1.61	1.67	6,000	0	na
1,1-Dichloroethene	--	< 0.75	< 0.75	--	4	0	0.06	0.01	35	0	na
cis-1,1-Dichloroethene	--	< 0.56	< 0.56	--	4	0	na	na	na	NA	na
1,1-Dichloroethane	--	< 0.69	< 0.69	--	4	0	0.04	0.01	200	0	na
1,2-Dichloropropane	--	< 0.69	< 0.69	--	4	0	0.04	0.03	na	NA	na
Dichloromethane	25.7	4.5	66.0	28.9	4	100	1.04	0.75	1,765	0	na
Chloroform	0.59	< 0.73	1.27	0.45	4	25	0.11	0.14	500	0	na
1,1,2,2-Tetrachloroethane	--	< 1.51	< 1.51	--	4	0	0.06	0.02	na	NA	na
Halocarbon 113	2.03	< 1.07	3.53	1.42	4	75	14.79	0.69	80,000	0	na
1,1,1-Trichloroethane	0.52	< 0.76	0.93	0.27	4	25	0.38	0.41	115,000	0	na
1,1,2-Trichloroethane	--	< 0.65	< 0.65	--	4	0	0.04	0.03	na	NA	na
Toluene	4.6	1.4	9.8	3.8	4	100	4.35	4.24	2,000	0	760
Benzene	0.93	0.67	1.41	0.32	4	100	1.41	2.14	na	NA	7
cis-1,3-Dichloropropene	--	< 0.64	< 0.64	--	4	0	na	na	na	NA	na
trans-1,3-Dichloropropene	--	< 0.50	< 0.50	--	4	0	0.02	0.01	na	NA	na
Trichloroethene	1.29	< 0.70	2.74	1.16	4	50	0.13	0.06	28,000	0	na
Tetrachloroethene	0.77	< 1.02	1.56	0.52	4	25	0.94	0.17	na	NA	na
Carbon tetrachloride	--	< 0.94	< 0.94	--	4	0	0.61	0.66	600	0	na
Ethylene dibromide	--	< 1.15	< 1.15	--	4	0	0.06	0.01	3	0	na
Ethylbenzene	--	< 0.65	< 0.65	--	4	0	0.77	0.83	4,000	0	200
m,p-Xylene	0.84	< 1.00	1.35	0.41	4	50	2.12	2.89	2,300	0	36
o-Xylene	--	< 0.82	< 0.82	--	4	0	0.68	1.03	na	0	na
1,3,5-Trimethylbenzene	--	< 1.28	< 1.28	--	4	0	0.27	0.30	na	NA	na
1,2,4-Trimethylbenzene	--	< 1.28	< 1.28	--	4	0	0.88	0.87	1,000	0	na
1,3-Dichlorobenzene	--	< 1.50	< 1.50	--	4	0	0.02	0.02	na	NA	na
1,4-Dichlorobenzene	--	< 1.74	< 1.74	--	4	0	0.19	0.18	na	NA	na
1,2-Dichlorobenzene	--	< 1.74	< 1.74	--	4	0	0.02	0.02	39,500	0	na
1,2,4-Trichlorobenzene	0.74	< 1.19	1.19	0.30	4	25	0.05	0.05	400	0	na
Hexachlorobutadiene	--	< 3.52	< 3.52	--	4	0	0.09	0.09	na	NA	na
Chlorobenzene	--	< 0.69	< 0.69	--	4	0	0.01	0.01	3,500	0	na
Styrene	6.39	< 8.52	8.52	2.46	4	50	0.17	0.01	400	0	na

Notes:

- (1) na denotes not available.
- (2) NA denotes not applicable.
- (3) Values represent guidelines established the Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
- (4) -- denotes not applicable.
- (5) Criteria obtained from the AGRA Intern Separation Zone Document, 2000.
- (6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (1999) and Halifax (1998).

TABLE 37 Fixed Station Ambient Air Monitoring Program November and December VOC Results Location 6: DesBarres Street

Nov/Dec 2001 Average ($\mu\text{g}/\text{m}^3$)	Nov/Dec Average ($\mu\text{g}/\text{m}^3$)	Minimum Value ($\mu\text{g}/\text{m}^3$)	Maximum Value ($\mu\text{g}/\text{m}^3$)	Standard Deviation	Number of Samples	% Detected	Typical Nov/Dec Average Levels in Hamilton ($\mu\text{g}/\text{m}^3$)	Typical Nov/Dec Average Levels in Halifax ⁽⁶⁾ ($\mu\text{g}/\text{m}^3$)	Regulatory Guideline ⁽³⁾		Separation Zone Short Term Criteria ⁽⁵⁾ ($\mu\text{g}/\text{m}^3$)
									24-hour ($\mu\text{g}/\text{m}^3$)	Number of Exceedances	
Dichlorodifluoromethane	0.73	< 0.71	1.03	0.22	6	83	2.66	2.67	500,000	0	na ⁽¹⁾
Chloromethane	0.58	< 0.60	1.09	0.29	6	67	1.05	1.08	7000	0	na
Halocarbon 114	-- ⁽⁴⁾	< 1.19	< 1.19	--	6	0	0.22	0.14	700,000	0	na
Vinyl chloride	0.12	< 0.20	0.20	0.04	6	17	0.02	0.01	1.0	0	na
Chloroethane	0.14	< 0.24	0.24	0.05	6	17	0.09	0.02	na	NA ⁽²⁾	na
1,2-Dichloroethane	0.41	< 0.61	0.61	0.16	6	33	0.07	0.05	na	NA	na
Bromomethane	0.37	< 0.35	0.82	0.26	6	50	0.14	0.08	1,350	0	na
Trichlorofluoromethane	2.43	1.97	3.20	0.48	6	100	1.61	1.67	6,000	0	na
1,1-Dichloroethene	--	< 0.75	< 0.75	--	6	0	0.06	0.01	35	0	na
cis-1,1-Dichloroethene	--	< 0.56	< 0.56	--	6	0	na	na	na	NA	na
1,1-Dichloroethane	--	< 0.69	< 0.69	--	6	0	0.04	0.01	200	0	na
1,2-Dichloropropane	--	< 0.69	< 0.69	--	6	0	0.04	0.03	na	NA	na
Dichloromethane	19.5	5.9	55.6	18.6	6	100	1.04	0.75	1,765	0	na
Chloroform	0.43	< 0.73	0.73	0.15	6	17	0.11	0.14	500	0	na
1,1,2,2-Tetrachloroethane	--	< 1.51	< 1.51	--	6	0	0.06	0.02	na	NA	na
Halocarbon 113	1.24	< 1.07	2.99	0.91	6	67	14.79	0.69	80,000	0	na
1,1,1-Trichloroethane	0.53	< 0.76	1.31	0.38	6	17	0.38	0.41	115,000	0	na
1,1,2-Trichloroethane	--	< 0.65	< 0.65	--	6	0	0.04	0.03	na	NA	na
Toluene	3.3	1.0	8.3	2.8	6	100	4.35	4.24	2,000	0	760
Benzene	0.79	0.54	1.41	0.34	6	100	1.41	2.14	na	NA	7
cis-1,3-Dichloropropene	--	< 0.64	< 0.64	--	6	0	na	na	na	NA	na
trans-1,3-Dichloropropene	--	< 0.50	< 0.50	--	6	0	0.02	0.01	na	NA	na
Trichloroethene	1.02	< 0.70	3.17	1.16	6	33	0.13	0.06	28,000	0	na
Tetrachloroethene	0.59	< 1.02	1.02	0.21	6	17	0.94	0.17	na	NA	na
Carbon tetrachloride	--	< 0.94	< 0.94	--	6	0	0.61	0.66	600	0	na
Ethylene dibromide	--	< 1.15	< 1.15	--	6	0	0.06	0.01	3	0	200
Ethylbenzene	--	< 0.65	< 0.65	--	6	0	0.77	0.83	4,000	0	36
m&p-Xylene	0.80	< 1.00	1.30	0.35	6	50	2.12	2.89	2,300	0	na
o-Xylene	0.48	< 0.82	0.82	0.17	6	17	0.68	1.03	na	NA	na
1,3,5-Trimethylbenzene	--	< 1.28	< 1.28	--	6	0	0.27	0.30	na	NA	na
1,2,4-Trimethylbenzene	--	< 1.23	< 1.23	--	6	0	0.88	0.87	1,000	0	na
1,3-Dichlorobenzene	--	< 1.50	< 1.50	--	6	0	0.02	0.02	na	NA	na
1,4-Dichlorobenzene	--	< 1.74	< 1.74	--	6	0	0.19	0.18	na	NA	na
1,2-Dichlorobenzene	--	< 1.74	< 1.74	--	6	0	0.02	0.02	39,500	0	na
Hexachlorobutadiene	0.69	< 1.19	1.19	0.24	6	17	0.05	0.05	400	0	na
Chlorobenzene	--	< 3.52	< 3.52	--	6	0	0.09	0.09	na	NA	na
Styrene	--	< 0.69	< 0.69	--	6	0	0.01	0.01	3,500	0	na
	6.39	< 8.52	8.52	2.33	6	50	0.17	0.01	400	0	na

Notes:
(1) na denotes not available
(2) NA denotes not applicable
(3) Values represent guidelines established by the Ontario Ministry of Environment Ambient Air Quality Criteria for a 24-hour averaging period.
(4) -- denotes not applicable
(5) Criteria obtained from the AGRA Interim Separation Zone Document, 2000.
(6) Values obtained from Environment Canada Air Monitoring Programs for Hamilton (1999) and Halifax (1998).

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4.4.4 Fixed Station Ambient Air Monitoring Program QA/QC Results

Field and laboratory quality control/quality assurance measures for the ambient air monitoring include a variety of measures to ensure that the data generated will be of a known quality and meet program requirements.

Data for the Fixed Station AAMP were evaluated in general accordance with the method requirements and the U.S. EPA Functional Guidelines for data review. Results of all reported quality assurance/quality control measurements were evaluated, including:

- Method blank results
- Field blank results
- Canister certification analyses for VOC
- Recoveries from blanks to which target chemicals had been added in known amounts (laboratory control spikes or LCS) for VOC, PAH and metals analyses
- Recoveries from portions of filter samples to which target metals had been added (matrix spikes or MS)
- Recoveries of surrogate compounds added to each PAH sample
- Recoveries of internal standards added to each VOC sample
- Results for field duplicate analyses
- Precision of results from PSC and Environment Canada

This review evaluates data on an analyte-specific and sample-specific basis. As a result of this review, data may be accepted as reported, qualified as estimated, qualified to be non-detected at elevated reporting limits or rejected. Separate data validation reports for each month were prepared and submitted.

Quantitative results may be qualified as estimated for a variety of reasons including:

- measurements below the demonstrated linear range of the instrument;
- high or low recoveries of surrogate compounds or from matrix spikes (samples to which target chemicals have been added);
- canister flow uncertainties; and
- changes in the pressure of a canister between the end of the sampling event and receipt at the lab.

The end result is that the identification is reliable but the measured concentration has a degree of uncertainty to it. When possible, the text of the validation report framed limits to this uncertainty; for example, if the surrogate recovery was low, the sample results are likely to be biased low to a comparable degree and the measured result represents only a portion of the actual air concentration. In many cases, however, it was not possible to put clear limits to the uncertainty. The sample specific reasons or why the data are considered estimated are detailed in the November and December Data Monthly Reports.

Results were qualified as non-detected with elevated reporting limits for dichloromethane (methylene chloride) and for a limited number of metals as a result of background contamination in the laboratory as noted in method blank results or from the field as noted in field blank results. Reported results were qualified as non-detected with the reporting limit set at the amount

actually detected when that amount detected in the sample could be attributable to background rather than the air sample itself.

The data generated for the months of November and December are of overall high quality and can be relied upon for program purposes. Accuracy, precision and completeness meet or exceed program objectives for most analyses. No results were rejected. The uncertainties in measurements that exist in the data set are primarily reflections of the low levels of chemicals present in the ambient air. With very limited exceptions, these data may be used with confidence for air quality characterization.

The data validation reports include results for field duplicates collected during the December sampling event and analyzed by both PSC and Environment Canada (Table 38).

TABLE 38 Analysis of Victoria Road Field Duplicates for December 15th
Comparison of Environment Canada and PSC Results

COMPOUNDS	MDL	ENVIRONMENT CANADA		MDL	PSC	
		Victoria Road Duplicate Results ($\mu\text{g}/\text{m}^3$)	Victoria Road Results ($\mu\text{g}/\text{m}^3$)		Victoria Road Duplicate Results ($\mu\text{g}/\text{m}^3$)	Victoria Road Results ($\mu\text{g}/\text{m}^3$)
Dichlorodifluoromethane	0.014	2.799	3.111	0.71	2.40	3.11
Chloromethane	0.012	1.113	1.236	0.60	1.16	2.48
Trichlorofluoromethane	0.010	2.032	2.276	0.79	2.02	3.15
Dichloromethane	0.013	10.675	26.395	0.69	10.77	29.88
Halocarbon 113	0.018	1.111	1.291	1.07	<1.07	<1.07
Toluene	0.013	3.111	2.662	0.49	1.58	2.11
Benzene	0.016	1.587	1.228	0.54	1.15	2.17

The field duplicate samples collected from the Victoria Road site on December 15th were submitted to Environment Canada for analyses prior to their submittal to PSC. Detection limits for the Environment Canada analyses are significantly lower than those achieved by PSC as a result of the differing mass spectrometer conditions, and Environment Canada detected several additional analytes at concentrations below the PSC detection limits. No analytes were reported by Environment Canada above the PSC limits that were not detected and reported by PSC. PSC did not detect any analytes not reported by Environment Canada.

Precision criteria are not typically applied to measurements made at concentrations less than 5 times the reporting limits, and only the dichloromethane measurements met this condition. Overall, however, the agreement between the two laboratories is within method expectations. Environment Canada noted that the dichloromethane was present at levels normally ascribed to contamination, "i.e., they grossly exceed typical ambient levels." It was noted in the data set that all field samples for December 15th had elevated levels of this compound, but the field blank had only a trace level typical of PSC background. There is no evident source for contamination by this compound during normal field sampling activities.

5.0 CONCLUSIONS

There were no exceedances to the referenced criteria for parameters sampled in the Portable GC Sampling Programs, the Technology Demonstration Program, and the Landfill Closure Project. During sampling performed in November and December under the Fixed Station AAMP, there was one exceedance to the CWS for $\text{PM}_{2.5}$ ($30 \mu\text{g}/\text{m}^3$) where a value of $33.26 \mu\text{g}/\text{m}^3$ was reported over a 24-hour period on December 15th, at the Kings Road location. The elevated $\text{PM}_{2.5}$ value is likely attributable to heavy vehicle traffic associated with Christmas shopping.

The Portable GC Program results for benzene and toluene analyses performed in March and June 2001 indicated that benzene and toluene are present in the airshed along roadways and near autobody shops at similar concentrations as reported in the area of the Domtar Tank and Benzol Plant. The levels appear to increase in areas around gasoline service stations. Benzene and toluene were not reported in the Cooling Grid area, nor at bulk fuel plants. The Portable GC Sampling program results for benzene in June reported most of the samples (38 out of 48 samples) as not detected, and in March benzene was not detected in 29 out of 34 samples. Toluene was not detected in 27 out of 48 samples in June with the highest concentrations at the Victoria Road Gas Station location. In March toluene was detected in only four samples.

During the Portable GC Program, benzene was detected at concentrations of 29 to $89 \mu\text{g}/\text{m}^3$ in six snow pore space samples around the Domtar Tank in March 2001. These results should be taken as qualitative confirmation that fugitive emissions from soil in the area around the Domtar release benzene into the ambient air, but no estimation of the impact on air quality can be made from this limited exercise.

The air monitoring performed as part of the Technology Demonstration Program indicated that there was no apparent evidence, from the comparison of VOC samples taken prior to the collection of bulk sediment samples compared with samples taken during the collection of bulk sediment samples, that the activities associated with the collection of the bulk sediment samples had contributed VOCs to the airshed. The background VOC results were similar to those obtained during the time of the bulk sediment sample collection. This review took into consideration prevailing wind directions on the days the samples were collected. Based on a review of the results compared with wind directions, the concentrations at the downwind sampling locations were not higher than concentrations reported for upwind locations. Comparing upwind PAH data with downwind PAH data indicates that on two occasions (July 27th and September 20th), the Tar Ponds appear to have contributed PAHs to the airshed, however, the reported values are still well below the referenced guidelines.

The air monitoring performed as part of the Landfill Closure Project indicated that there was no apparent evidence, from the comparison of TSP samples taken prior to activities at the Landfill compared with samples taken during activities and taking into consideration prevailing wind direction, that the activities appreciably contributed particulate matter to the airshed. There was one day (September 20th) that the downwind sampling location (Frederick Street) reported a TSP value ($68.48 \mu\text{g}/\text{m}^3$) higher than the upwind sampling locations, however, the reported value was approximately half the referenced guideline.

A comparison of PM_{2.5} and PM₁₀ average November and December 2001 data with levels in the cities of Hamilton and Montreal for November and December 2000 indicated that with the exception of the PM_{2.5} results for Kings Road and Intercolonial Street, average results for the Sydney AAMP were below those found in the other cities. The PM_{2.5} average value at Kings Road was higher than the average value for Hamilton and Montreal. The PM₁₀ average value at Intercolonial Street was lower than the Hamilton average value and higher than the Montreal average value. Total PAH average November and December 2001 results identified in the Sydney airshed were higher than the average results identified in 2000 in St. John's and lower than the average total 2001 PAH value for Hamilton. Generally, VOC compounds measured in the Sydney airshed, such as benzene, toluene and o,m,p xylenes, that are known to be site contaminants for both the Coke Ovens and Tar Ponds sites were below levels found in the Hamilton and Halifax airsheds. Some of the USEPA Method TO14 chlorinated compound were found in the Sydney airshed at levels that were marginally higher than those found in the Hamilton and Halifax airsheds.

A comparison of the PAH data for November and December 2001 average results with November and December 2000 average results indicates that the results are similar between the two time periods for both the Victoria Road and the Frederick Street location. There were more detected VOC compounds at Victoria Road and Frederick Street in November and December 2001 than for the same time period in 2000. This resulted in higher average VOC values for 2001 for most compounds except for benzene and 1,2,4-trichlorobenzene at the Frederick Street location, which were lower in 2001 than in 2000. The dichloromethane parameter is the most noticeably different with an average November and December concentration of 19.74 µg/m³ for 2001 versus <0.2 µg/m³ for 2000. It is likely, however, that this compound is attributable to background levels in the laboratory.

A review of the program has determined that metals are rarely detected in the PM_{2.5} samples. In order to further assess metals that are found in the Sydney airshed, it is recommended that analysis for metals in PM_{2.5} be discontinued and sampling for metals be initiated using TSP high volume samplers at three or four of the program locations. As well, there are referenced guidelines available for metals analyzed for the TSP fraction.

6.0 REFERENCES

- Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profiles. US Public Health Service, US Department of Health and Human Services, Atlanta, GA.
- Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological Profiles. US Public Health Service, US Department of Health and Human Services, Atlanta, GA.
- AMEC Earth & Environmental Limited. Development of Interim Separation Zones, Former Coke Ovens site, Sydney, Nova Scotia, 2000.
- AMEC Earth & Environmental Limited. Ambient Air Monitoring Program, Muggah Creek Remediation Project, November 2001 Sampling Events, Former Coke Ovens site, Sydney, Nova Scotia.
- AMEC Earth & Environmental Limited. Ambient Air Monitoring Program, Muggah Creek Remediation Project, December 2001 Sampling Events, Former Coke Ovens site, Sydney, Nova Scotia.
- AMEC Earth & Environmental Limited. Ambient Air Sampling Program with Analysis using a Portable Gas Chromatograph Photoionization Detector Report, March 2000.
- AMEC Earth & Environmental Limited. Ambient Air Sampling Program with Analysis using a Portable Gas Chromatograph Photionization Detector Report, December 2000.
- AMEC Earth & Environmental Limited. Air Quality Monitoring during Excavation Activities, South Tar Pond, Bench Scale Treatability Project Report, 2001.
- Canadian Environmental Protection Act. Priority Substances List Assessment Report: Polycyclic Aromatic Hydrocarbons, 1994.
- CBCL/CRA. Phase I Site Assessment Muggah Creek Watershed. January 2000.
- CBEG (Cape Breton Environmental Group), 1997. Material Sampling Program, Coke Ovens; Prepared for Environment Canada.
- CEPA/FPAC, 1998. National Air Quality Objectives for Particulate Matter. Part 1: Science Assessment Document. A Report of the CEPA/FPAC Group on Air Quality Objectives and Guidelines. Minister of Public Works and Government Services. Cat. No. HJ46-2/98-220.
- Environment Canada, 1993. Canadian Climate Normals, 1961-1990, The Atlantic Provinces.
- JWEL, 1998. Report to Environment Canada on Coke Ovens Material Sampling Program, Follow Up.
- JWEL, 1998. Coke Ovens Material Sampling Program, Follow-Up; Prepared for Environment Canada.

Ambient Air Monitoring Program, 2001 Annual Summary Report – **FINAL REPORT**
Muggah Creek Remediation Project, Sydney, NS
NS Department of Transportation and Public Works
August 2002



United States Environmental Protection Agency, 1997. Part II: National Ambient Air Quality Standards for Particulate Matter; Final Rule, 40 CFR part 50, Appendix L, Federal Register, Vol. 62, No. 138.

United States Environmental Protection Agency. Source Contributions to PM_{2.5} in Ambient Air. September 1999, website - www.epa.gov